# Chemical Week

March 8, 1958

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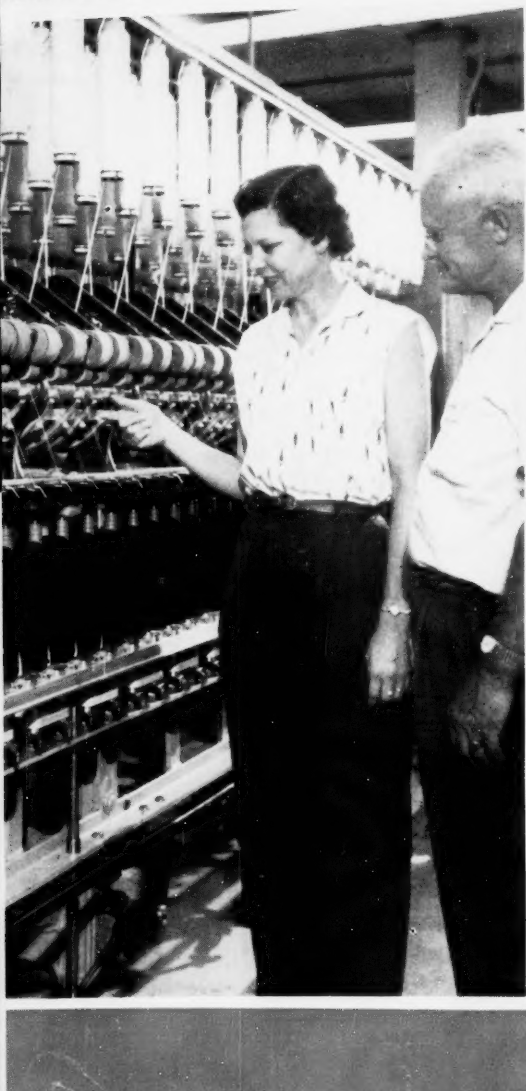
## Man-Made Fibers on Move

*CW Report page 93*







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Chemical Week

## TOP OF THE WEEK

March 8, 1958



**Vol. 82**
**No. 10**

Chemical Week (including Chemical Specialties and Chemical Industries) is published weekly by McGraw-Hill Publishing Co., Inc., 330 W. 42nd St., New York 36, N.Y. Printed in U.S.A. Second-class mail privileges authorized at Philadelphia, Pa.  Subscription: $3/year in U.S.A., U.S. Possessions; $4, Canada; $15, other Western Hemisphere countries; $25, all other countries. Also see p. 4.

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**MARCH 8, 1958** **Vol. 82, No. 10**

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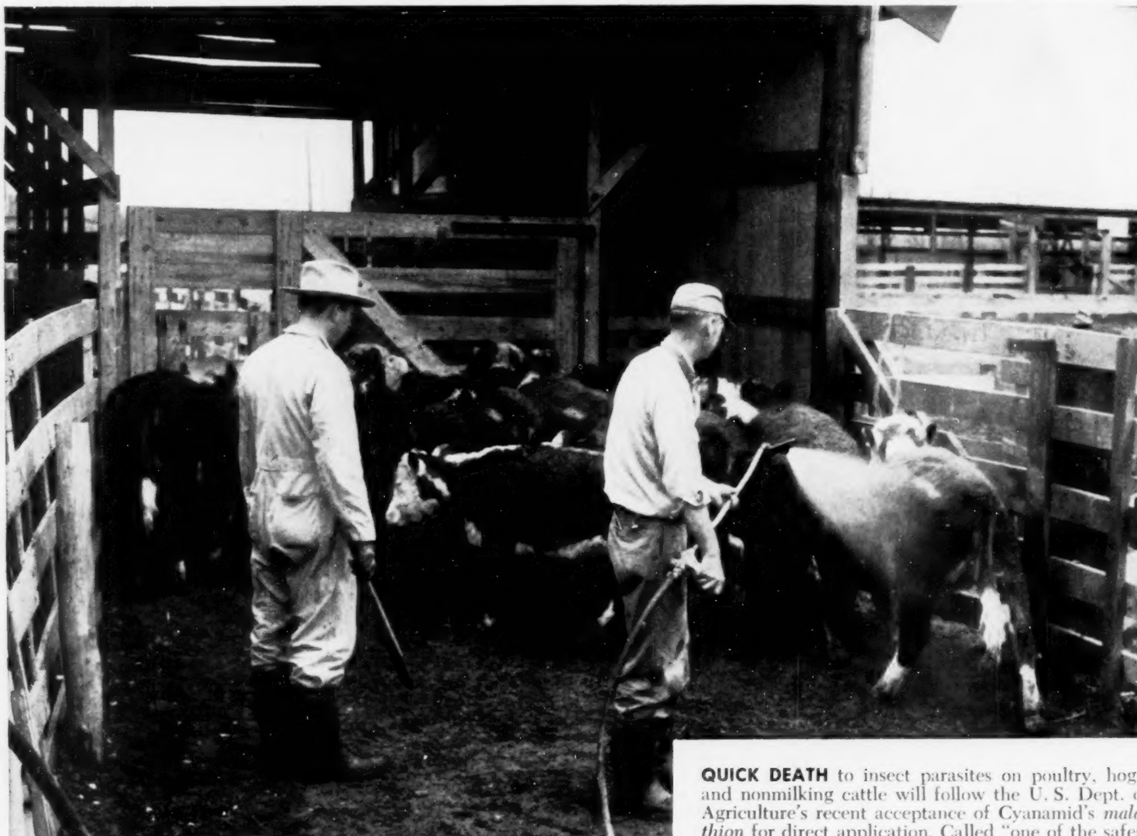
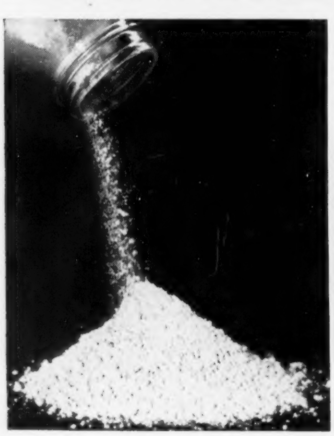
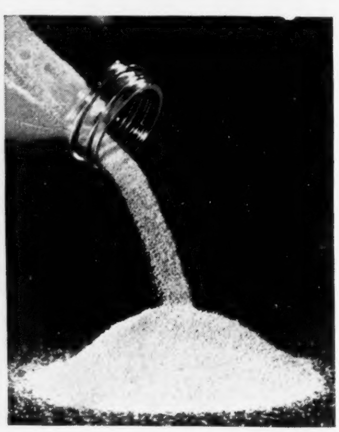
# Life on the Chemical Newsfront



**QUICK DEATH** to insect parasites on poultry, hogs, and nonmilking cattle will follow the U. S. Dept. of Agriculture's recent acceptance of Cyanamid's *malathion* for direct application. Called "one of the safest insecticides to handle," malathion provides effective control of lice on swine, and lice and ticks on cattle. It is specially valuable in louse control, where indications are that it kills eggs as well as adults, thus extending protection. The broad-spectrum killing power of malathion is particularly useful on poultry where lice, mites and ticks are simultaneously brought under control. (Phosphates and Nitrogen Division)





**NEW FREE-FLOWING PELLETS** permit rubbermakers to handle the popular MBTS *Accelerator* with less dust and greater accuracy. The lumping and dusting typical of the powdered material are eliminated by these formed spherical pellets that pour freely and, shown on the right, are virtually dust-free. In the mixing operation, Cyanamid MBTS Pellets crush instantly and disperse uniformly. Pelletizing is the latest of several innovations made by Cyanamid's Rubber Chemicals Department toward producing a benzothiazyl disulfide accelerator with optimum handling and performance characteristics. (Organic Chemicals Division)

**PUTTING A "BACKBONE" IN WATER** is a recently developed role for N,N'-*methylenebisacrylamide*. Used in conjunction with acrylic monomers, it forms stable gels in which the water content runs as high as 95%. Added to the monomers which give normally water-soluble polymers, N,N'-methylenebisacrylamide forms stiff gels impermeable to water due to its cross-linking action. The setting time of each gel can be controlled to range from several seconds to hours. A data sheet is available from Cyanamid.
(Market Development Department)

**STILL TOPS IN COLOR PERMANENCE** are the Vat Dyes used for cottons, washable rayons and linens. Fixed for the life of these textile fibers, Vat Dyes withstand all the sun, wear and washing that the fabric itself can tolerate. Cyanamid *Vat Dyes* are available in an ever-widening color range, each conforming to the rigid industry standards endorsed by the Vat Dye Institute to which Cyanamid belongs. Buyers are assured of this high-quality performance when garment tags bear the statement "Guaranteed Vat Color." (Organic Chemicals Division)

**REDUCING RAW MATERIAL AND PROCESSING COSTS** are some of the benefits obtained through the use of CYQUEST 40* *sequestering agent*. Producers and purchasers of raw materials can use this remarkable sequesterant to maintain high-quality standards while avoiding costly purification steps to remove metal ions that spoil color, cause turbidity and catalyze degradation reactions. CYQUEST 40 ties up troublesome metal ion impurities in raw materials, eliminating their detrimental effect on processes and products. (Industrial Chemicals Division)

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*For further information on these and other chemicals, call, write or wire American Cyanamid Company*


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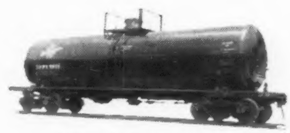
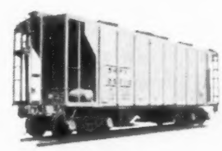
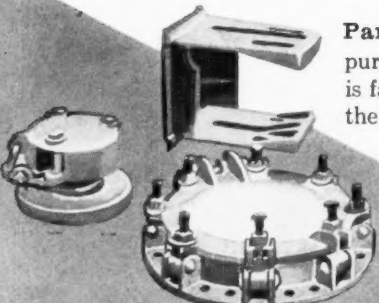


*ACF-DURADOME Tank Cars — modern way to safely ship all types of bulk liquids.*



*ACF-Covered Hopper Cars prevent costly contamination, reduce handling costs.*



**Parts** – A full complement of parts may be purchased through the Shippers' offices. This is facilitated by the newest parts catalog in the industry containing over 2,000 items.

**Sales** – Shippers' six Sales Offices are staffed by men eager to help and able to draw upon the total resources of ACF Industries in providing service.

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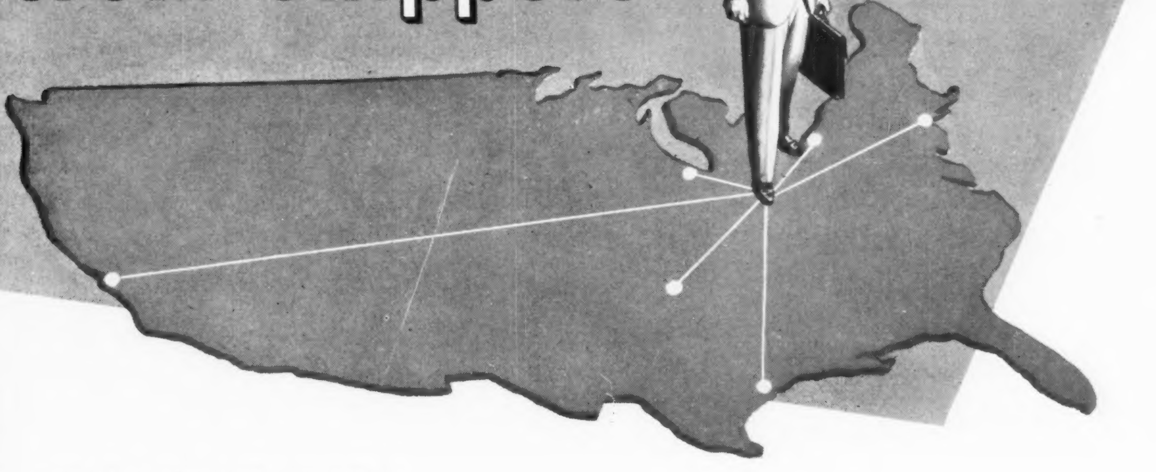

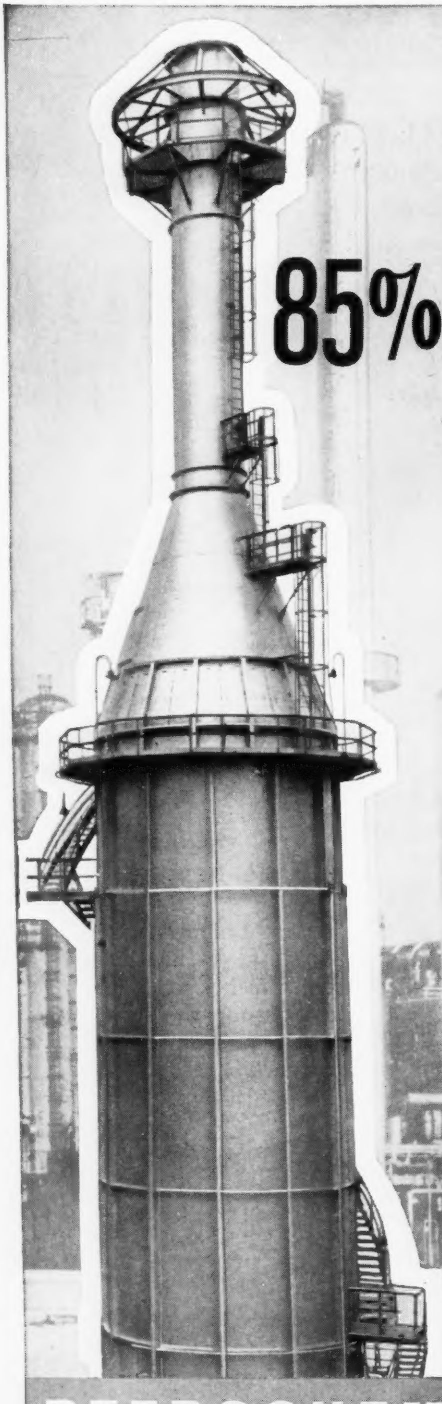

# BUTADIENE CAPACITY INCREASED 365,000 Tons/yr in 1957

# 85% THRU ISOFLOW HEATERS

***...and "Isoflows" in five new Butadiene plants are additionally supplying 1,000,000 lbs/hr of superheated steam up to 1400° F***

**Butadiene capacity is mushrooming to meet the rising demands of synthetic rubber and chemicals. Of the new butadiene plants put into operation during 1957, Petrochem Isoflow Furnaces have been installed in the 5 largest, representing approximately 85% of the total increased capacity in the U.S.**

**Isoflow Furnaces efficiently perform two important heating functions, depending upon the butadiene process involved:**
**(A) To heat directly the butane-butene feed stock and steam to a high temperature for dehydrogenation.**
**(B) To supply highly superheated steam which in turn heats the butane-butene stock for dehydrogenation.**

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- **Short Length of Liquid Travel**
- **Series, Multipass, all parallel flow**
- **Excess Draft for High Overload**

**For butadiene production, catalytic reforming or any other petroleum, petrochemical or chemical process there's a Petrochem Isoflow Furnace for any duty, temperature and efficiency.**

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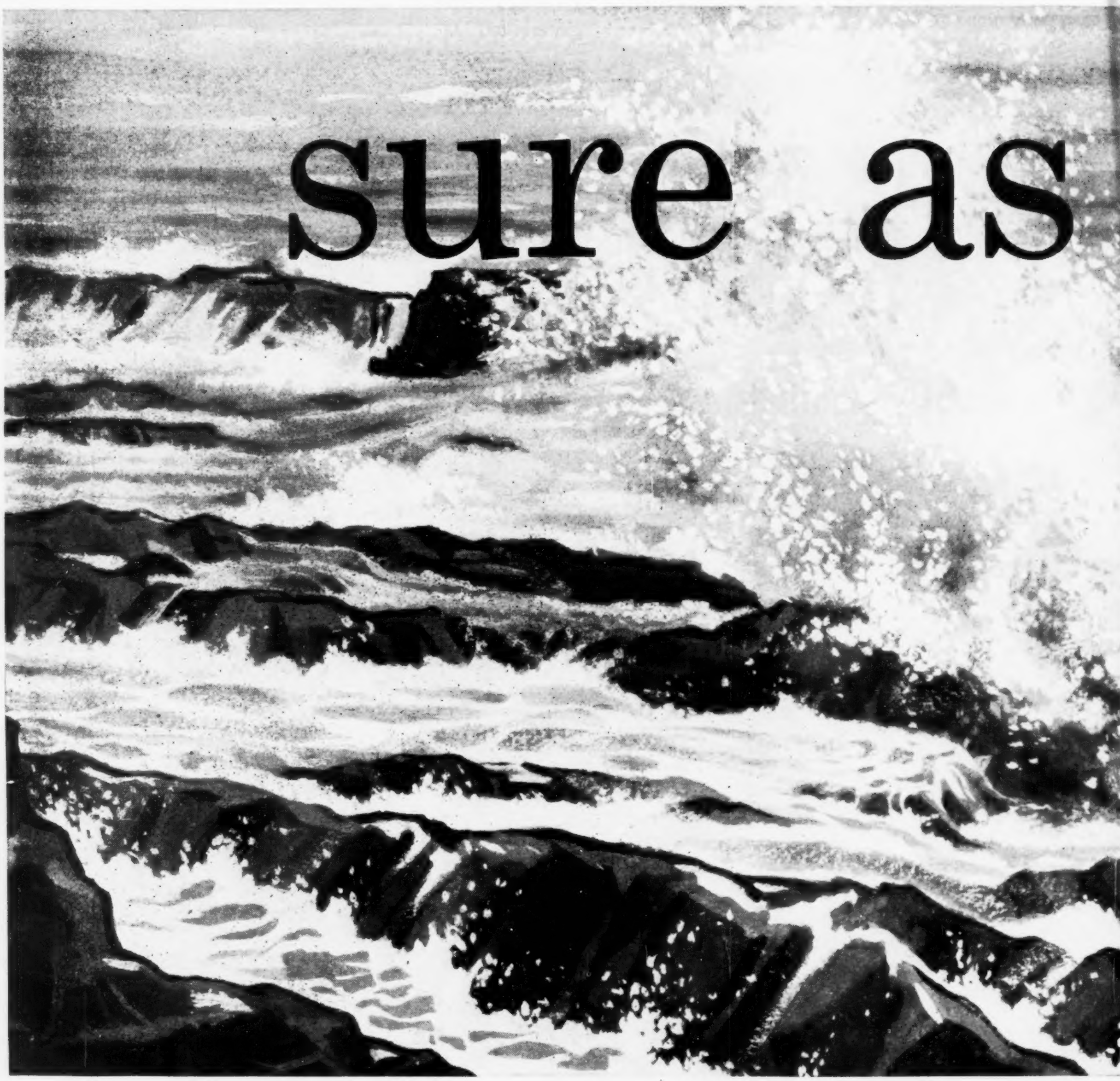
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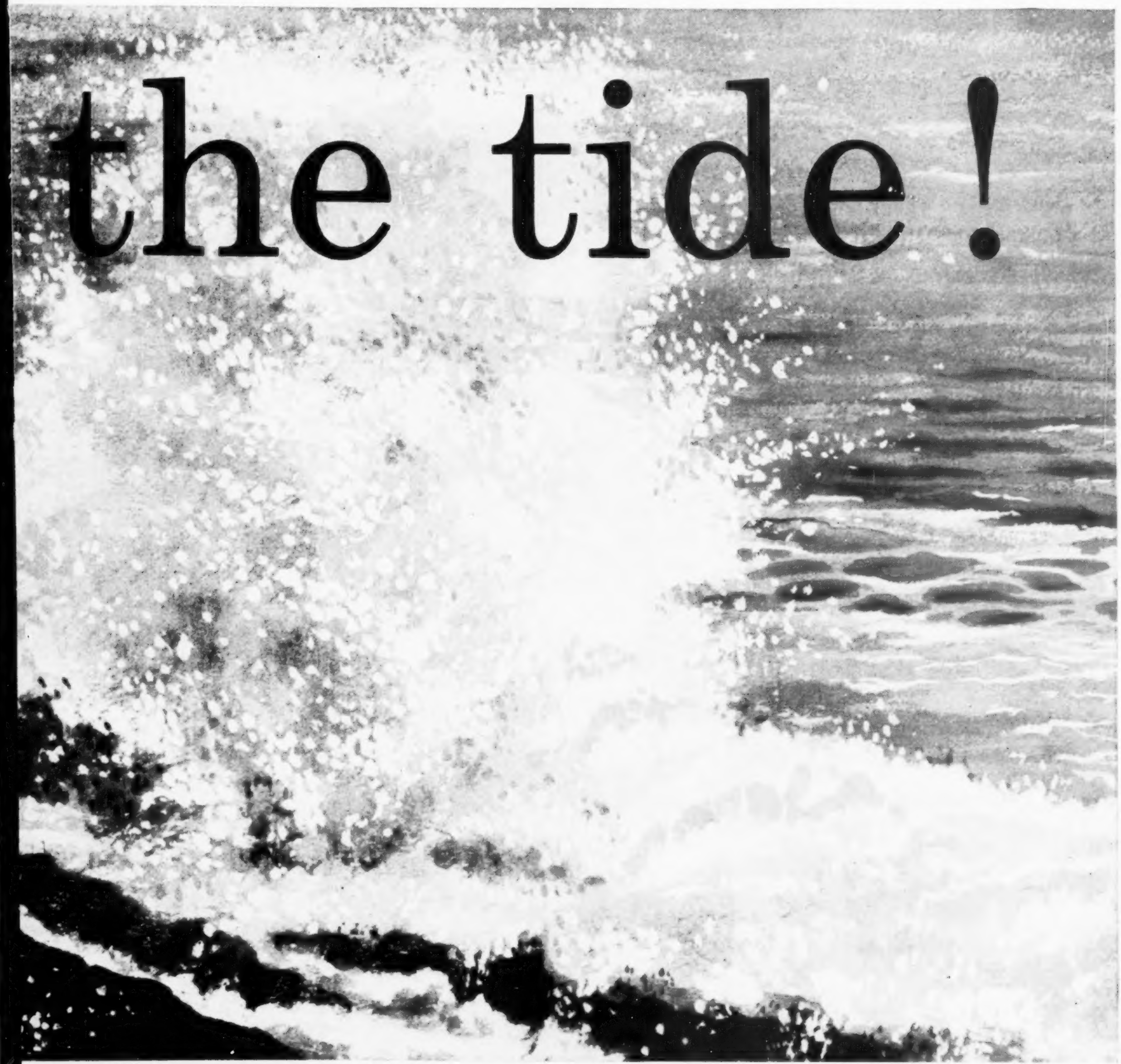


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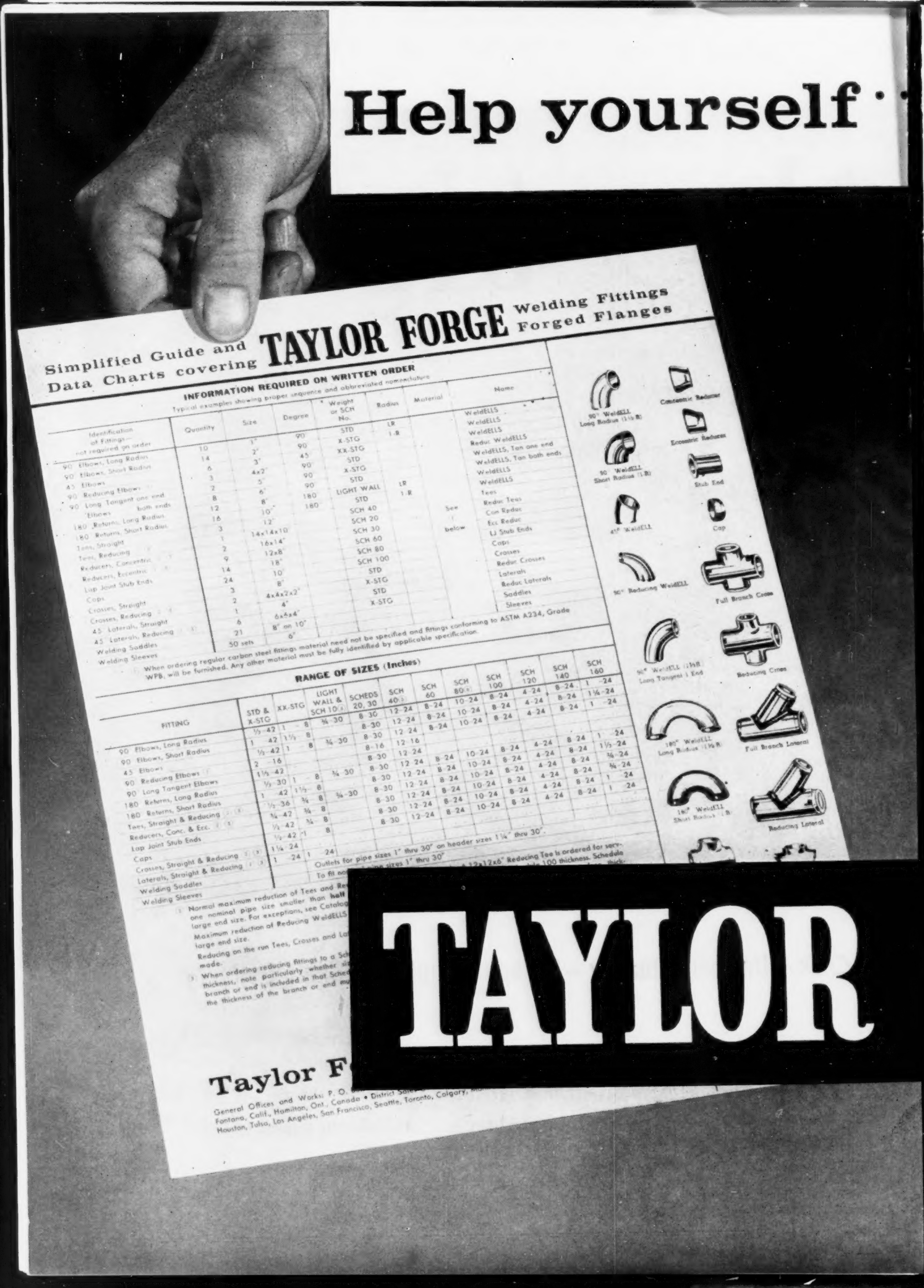

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a report by LINDSAY

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What interests us particularly, and will you, is the fact that so many research people are intrigued with the practical possibilities of these unique materials. The large amount of research now being done on high purity rare earth oxides in a wide variety of industries encourages us to suggest the likelihood that they may offer you opportunities for potentially profitable investigation.

Already, in a little more than two years since rare earths in purities up to 99.99% became available in commercial quantities, they are being used as basic production materials in many chemical and industrial operations.

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We have expanded our production facilities to keep up with demand and now have more than 100 ion exchange columns in continuous operation. Quantities are large enough to assure you a dependable source of supply. Prices are low enough to make their use on a production basis economically sound.

*Most of the high purity rare earth and yttrium oxides are available for prompt deliveries in quantities of an ounce to hundreds of pounds.*

We can't tell you how to use high purity rare earths in your production operations, nor can we promise that one of them may be the missing element in new process or product developments on which you are working. We *can*, however, supply you with data which you will find interesting, revealing and quite possibly of immediate importance to you.

**TYPICAL MAXIMUM IMPURITIES IN LINDSAY PURIFIED RARE EARTH AND YTTRIUM OXIDES**

| ATOMIC NO. | OXIDE | CODE | PURITY | % RARE EARTH MAXIMUM IMPURITIES AS OXIDES |
|---|---|---|---|---|
| 57 | $La_2O_3$. LANTHANUM OXIDE | 528<br>529 | 99.99<br>99.997 | 0.01 Pr, 0.001 Ce.<br>0.0025 Pr, 0.0005 others |
| 58 | $CeO_2$. CERIC OXIDE | 215<br>216 | 99.8<br>99.9 | 0.2 (largely La + Pr + Nd).<br>0.1 (largely La + Pr + Nd). |
| 59 | $Pr_6O_{11}$. PRASEODYMIUM OXIDE | 726<br>729.9 | 99<br>99.9 | 1 La + Nd + smaller amounts of Ce and Sm.<br>0.1 Ce + Nd. |
| 60 | $Nd_2O_3$. NEODYMIUM OXIDE | 628<br>629<br>629.9 | 95<br>99<br>99.9 | 1-4 Pr, 1-4 Sm, 0.5-1 others.<br>0.1-0.4 Pr + 0.1-0.4 Sm + 0.5 others.<br>0.1 (largely Pr + Sm). |
| 62 | $Sm_2O_3$. SAMARIUM OXIDE | 822<br>823 | 99<br>99.9 | 0.2-0.7 Gd, 0.2-0.6 Eu, and smaller amounts of others.<br>0.1 (largely Nd + Gd + Eu). |
| 63 | $Eu_2O_3$. EUROPIUM OXIDE | 1012<br>1011 | 98-99<br>99.8 | 1-2 Sm + smaller amounts of Nd + Gd + others.<br>0.2 (largely Sm + Gd + Nd). |
| 64 | $Gd_2O_3$. GADOLINIUM OXIDE | 928.9<br>929.9 | 99<br>99.9 | 1 Sm + Eu + trace Tb.<br>0.1 Sm + Eu + trace Tb. |
| 65 | $Tb_4O_7$. TERBIUM OXIDE | 1803<br>1805 | 99<br>99.9 | 1 Gd + Dy + Y.<br>0.1 Gd + Dy + Y. |
| 66 | $Dy_2O_3$. DYSPROSIUM OXIDE | 1703<br>1705 | 99<br>99.9 | 1 (largely Ho + Y + Tb + small amounts of others).<br>0.1 Ho + Y + traces of others. |
| 67 | $Ho_2O_3$. HOLMIUM OXIDE | 1603<br>1605 | 99<br>99.9 | 1 (largely Er + Dy + small amounts of others).<br>0.1 Er + Dy + traces of others. |
| 68 | $Er_2O_3$. ERBIUM OXIDE | 1303<br>1305 | 99<br>99.9 | 1 Ho + Dy + traces Yb and Y.<br>0.1 Ho + Tm. |
| 69 | $Tm_2O_3$. THULIUM OXIDE | 1405<br>1403 | 99.9<br>99 | 0.1 Er + Yb + trace Lu.<br>1 Er + Yb + trace Lu |
| 70 | $Yb_2O_3$. YTTERBIUM OXIDE | 1201<br>1202 | 99<br>99.9 | 1 Er + Tm + trace Lu.<br>0.1 Tm + trace Lu + Er. |
| 71 | $Lu_2O_3$. LUTETIUM OXIDE | 1503<br>1505 | 99<br>99.9 | 1 Yb + Tm + traces of others.<br>0.1 Yb + Tm + traces of others. |
| 39 | $Y_2O_3$. YTTRIUM OXIDE | 1112<br>1115<br>1116 | 99<br>99.9<br>99.9+ | 1 Dy + Gd + traces Tb and others.<br>0.1 Dy + Gd + traces Tb<br>Approx. 0.05 Dy + Gd. |

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**GLYCERINE.** Synthetic and U.S.P. Used in adhesives, alkyd resins, cellophane, cork products, cosmetics, dynamite, paper, drugs, rubber and tobacco.

**PROPYLENE GLYCOL.** Product of consistent high purity —U.S.P. grade. Widely employed in food, drug, tobacco, and cosmetic industries. Clear, colorless liquid completely miscible with water, also excellent solvent for water-insoluble organic chemicals.

**DIPROPYLENE GLYCOL.** Clear, colorless liquid used in resins, printing inks, plasticizers, cutting oils, textile softeners and many other products.

**ETHYLENE GLYCOL.** Ingredient in manufacture of permanent type antifreeze, resin plasticizer, alkyd resins and synthetic fibers.

**DIETHYLENE GLYCOL.** Utilized in gas dehydration, as a solvent in vapor set inks, as an intermediate in the manufacture of some resins, as a plasticizer for cork and in Udex Systems.

***you've probably heard of these***

**POLYETHYLENE GLYCOLS.** Available in 12 molecular weights from E200 to E20,000, ranging from viscous liquids through waxy and hard, tough solids. Used as plasticizers, lubricants, solvents, and as carriers in cosmetic preparations.

**POLYPROPYLENE GLYCOLS.** "P" series liquid through entire molecular weight range, P250 through P4,000. Employed as lubricants, solvents, plasticizers and antifoam agents. Polyglycol P2,000 (Resin Grade) has gained widespread acceptance for use in urethane foams.

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***have you heard of these?***

**HYPROSE* SP 80.** Reaction product of sucrose and propylene oxide to give viscous liquid with eight hydroxyl groups. Offers interesting possibilities as surface-active agent, intermediate, plasticizer and urethane cross-linking agent.

**HYPRIN* GP 25.** Made by similar reaction to the one that produces Hyprose SP 80 except that it is a reaction product of glycerine and propylene oxide. Hyprin GP 25 shows promise as plasticizer and alkyd resins intermediate.

**POLYGLYCOL 11 SERIES.** Trihydroxy polypropylene glycols available in five viscosities, 80 through 400 centistokes at 100°F. These polyglycols look promising as nitrocellulose plasticizers and as intermediates for urethane polymers.

**POLYGLYCOL 13 SERIES.** Best described as non-film-forming, non-crystalline polyethylene glycols. Liquid series available in three viscosities—300, 20,000, and 50,000 cks. at 100°F. Utility as water soluble thickener in fire-resistant hydraulic fluids, also possible ingredients in hair oil formulations.

**POLYGLYCOL 15 SERIES.** Polyglycol 15-200 is widely

Salesmen Exchange Latest Ideas

Research Staff Screens Newest Polyols

# get your polyols from the men that make the most of them

Technical Service Team Confers on Customer Problem

Here at Dow, we have a group of men devoting their entire time to the manufacture and marketing of almost every polyol you have heard of (some you might not even have heard of). Some of these men are specialists in research and technical service. Some of them direct the actual production of the polyols. Some of them are men you know personally as the salesmen from Dow. And some of them are management men who guide the direction of future efforts.

All of them together are busy developing every possible benefit you can get from polyols. They are the men that make the most of them.

Now—How can you make the most of them, too?

**1.** *If you need a number of polyols in the manufacture of your product, you can enjoy the convenience of getting all of them from one source . . . all the time, any time. You can't find a broader range of polyols anywhere.*

**2.** *If you need only one polyol out of the entire line, you still benefit from the total experience that made the broad range possible. You get your polyols from the men that make the most of them.*

Write for "World's Widest Line of Polyols", The Dow Chemical Company, Midland, Michigan, Dept. GC-945A-1

incorporated in brake fluid formulations. The "15" series is available in four viscosities 100, 200, 500 and 1,000 cks. Has water solubility and a wide range of organic solubility—therefore many are useful as couplers in water-organic systems.

**POLYGLYCOL 166 SERIES (Polyepichlorohydrin).** New polyglycol series with terminal OH groups and chloromethyl side chains. Offers dual reactivity sites. Three viscosities—450, 900, 1150 centistokes.

**POLYGLYCOL 174 SERIES (polystyrene glycol).** Viscous liquid in two molecular weights—500 and 750. Interesting possibilities as urethane intermediates in making coatings and resins with high dielectric constants.

**POLYBUTYLENE GLYCOLS.** Available in four molecular weights—500, 1000, 1500, 2000; all liquid and very hydrophobic with very high organic solubility. Possibilities as intermediates for oil additives and hydrophobic urethane foams.

**DOWANOL* 122.** Technically di (ethylene glycol) p, p'-isopropylidenebisphenyl ether. A white powder which can be used with dibasic acids to form alkyd resins by conventional methods.

**STYRENE GLYCOL.** New chemical intermediate which offers method of incorporating phenyl ring into products through two reactive OH groups. White crystalline solid with pleasant odor.

## unheard of!

In addition to the hundreds of commercial and experimental polyols already prepared by Dow, many additional ones are being actively developed. These yet unborn products will expand many of the present Dow polyol lines. And expansion will be accompanied by a similar expansion of their applications as chemical intermediates, plasticizers, emulsifiers, lubricants, antifoamers, coolants, solvents, de-dusters, etc.

For news of the polyols to come, keep in touch with Dow!

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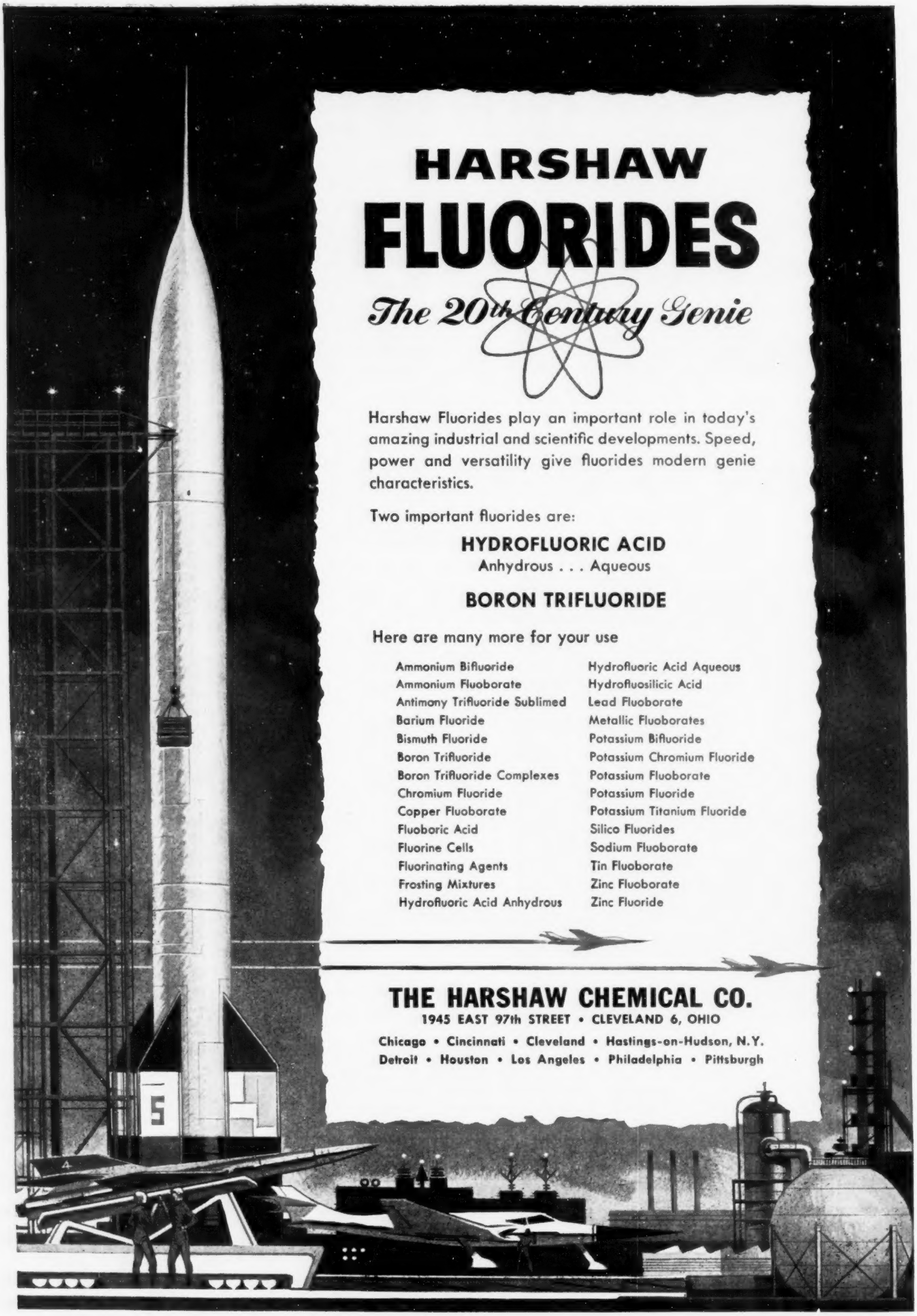
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Division of Albemarle Paper Mfg. Co.
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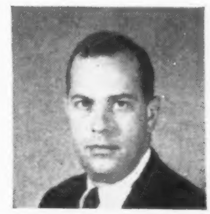

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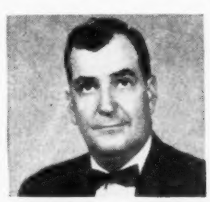

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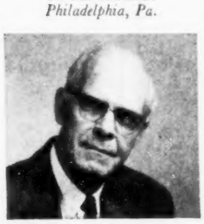
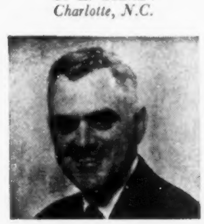


Frank Finegan
*Kansas City, Mo.*



Dave Flook
*Denver, Colo.*

C. A. Dillon
*Houston, Texas*

T. B. Athey
*Baltimore, Md.*

# OPINION

## Cost Control

To THE EDITOR: May I convey my congratulations on the excellent article in the Jan. 25 issue by W. I. McNeil of Calkin & Bayley, Inc.

It is timely and should be of interest to all concerned with costs.

MURRAY LIASSON
Liasson Co.
New York

## Automation Without Layoffs

To THE EDITOR: Rarely have I seen such weird conclusions from incomplete statistics as given in your article titled "Automation Without Layoffs" (*Nov. 23, '57, p. 47*).

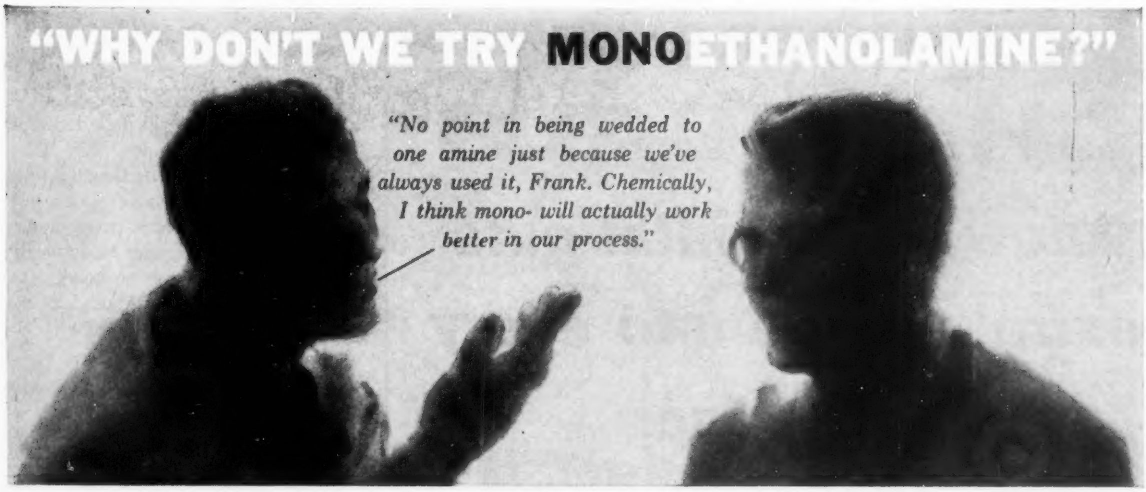
Assuming that the refinery in question is part of a company enjoying excellent credit, a conservative figure of 4% interest would give the annual interest cost, for the increased capital per employee ($46,000 higher in 1956 than in 1948), of about $2,000. Assuming even an extremely low depreciation rate (20 years), this would add another $2,000 to cost per employee per annum. In other words, the most conservative calculation gives us an increased cost of $4,000 per annum per employee.

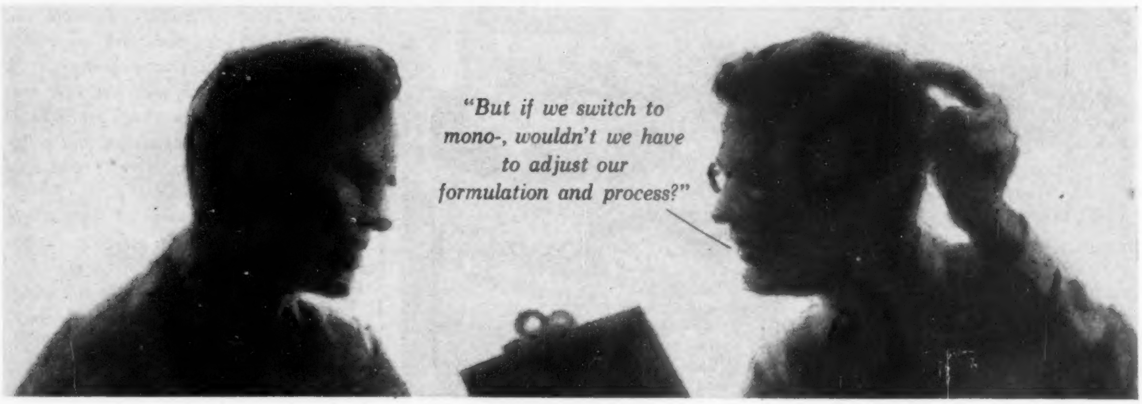
Does your writer expect us to believe that with production remaining stable, the company found it profitable to absorb an increased cost of $4,000 (ye Gods!) per employee? Or did he just forget to mention that production doubled (or tripled) in the period? And if this is the case, what's news about it? Just where is the trick in maintaining employment when the market will absorb increased production?

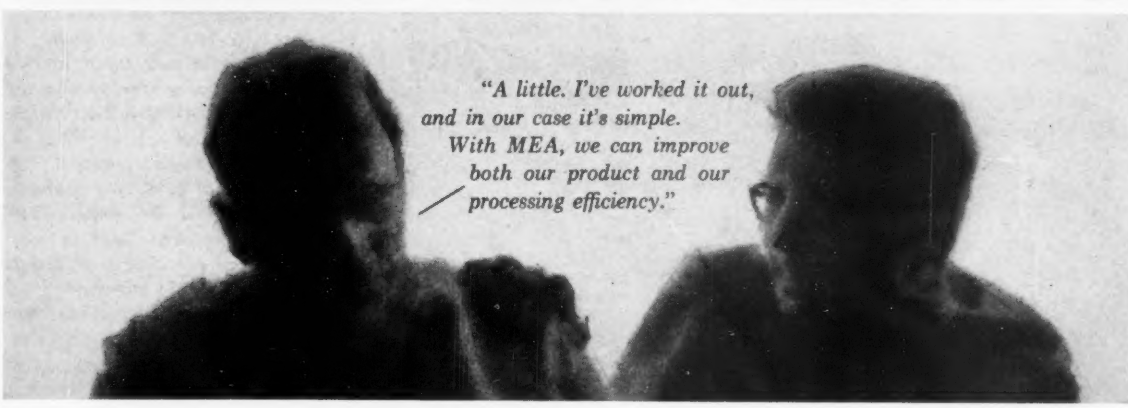
Frankly, I am extremely puzzled by it all. Has CHEMICAL WEEK turned from technical information to propaganda? And if so, does CHEMICAL WEEK consider that propaganda that's

*CW* welcomes expressions of opinion from readers. The only requirements that they be pertinent, as brief as possible.

Address all correspondence to H. C. E. Johnson, Chemical Week, 330 W. 42nd St., New York 36, N.Y.




It won't hold for everybody, but in some applications where di- or triethanolamine is being used, there are positive advantages to be gained from switching to mono-. For example, MEA can frequently be used advantageously as the amine in amine soap emulsifiers for such products as cutting oils, weedicides, waxes and buffing compounds. In some instances total amine required is reduced to the extent that cost is reduced. In some cases mixtures of MEA and TEA are better than either alone. MEA may improve performance while TEA maintains a lower pH.

If your product or process now utilizes DEA or TEA, it may pay you to evaluate MEA. Allied makes all three, and will give you technical suggestions that may help you shave costs, improve efficiency or make a better product. Write for any technical assistance you need.

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aimed at its own readers need be on no higher level than that good enough for readers of the tabloids?

Incidentally, I am a consultant to management, not to labor. I am not opposed to management propaganda, but I think that in order to serve its purpose it will have to be good.

MAX CARASSO
New York

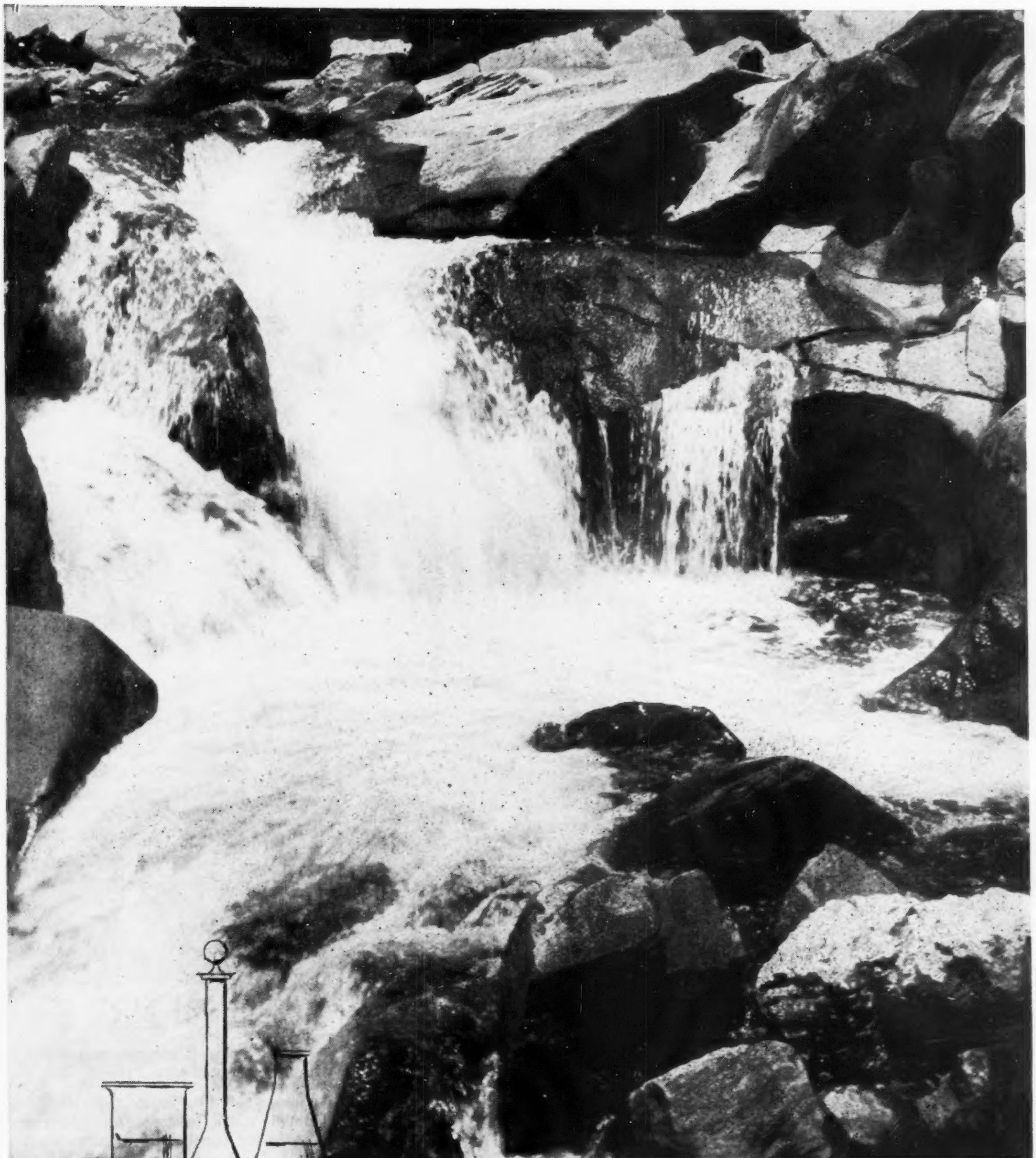
*Reader Carasso's criticism is entirely valid on at least one point:* CW *should have stated that the refinery's 1948-56 expansion and modernization program increased throughput from 35,000 bbls./day to 55,000 bbls./day, with higher yield of quality gasoline per barrel of crude and with upgraded quality of output. Our only defense as to this omission is that the vast majority of our readers would readily understand that an expansion and modernization program would obviously have such objectives.*

*But the main point of our article was that—at present, at least—automation appears to be an integral part of an expanding economy in which rising productivity (output per man-hour) goes hand-in-hand with relatively stable employment on a plant-by-plant basis and with gradually increasing total employment on a long-range, economy-wide basis. Accordingly, as we read the BLS case study, present evidence does not support the quoted contention by OCAW President Knight that "layoffs in oil and chemical industries will be caused principally by the installation of new equipment and automation." And we believe Mr. Knight would concede that in most cases, the current flurry of layoffs* (CW, Jan. 18, p. 25) *stems not from improved technology but from the general downturn in the national economy.*—ED.

## Not a Bypass

TO THE EDITOR: We want to compliment you on your discussion of our new analog computer (*Jan. 4, p. 42*). On the whole, the article is well written and is descriptive of our installation and activities.

However, in preparing the headline and the first paragraph, someone obviously was carried away . . . in the use of the word "bypass." The analog computer will never take the place of pilot plants, and none of our use of it is directed at any such objective. It



can multiply the benefits gained from good research and pilot-plant work, and can obviate the need for carrying out expensive "optimizing" research on a pilot-plant scale. . . .

We can properly expect an immediate and strong reaction from experienced research and engineering personnel, and we wish them to know that the bypassing of necessary pilot-plant studies is your idea, not ours, and that we in no way subscribe to nor endorse it.

H. K. Nason
Vice-President, General Manager
Research and Engineering Division
Monsanto Chemical Co.
St. Louis, Mo.

*"Bypass" is too strong a word. Still, Monsanto admits that the computer will "obviate the need for carrying out expensive 'optimizing' research on a pilot-plant scale."*—Ed.

## Report on Vinyls

To the Editor: . . . When "Vinyls: Kingpin Among Plastics" (*Nov. 16, '57*) first appeared, I called it to the attention of our sales department with the suggestion that the sales and laboratory personnel concerned with vinyl materials would benefit by reading this article. The sales manager concurred, and it will be distributed as soon as it is reprinted.

David Given
Bakelite Co.
New York

# MEETINGS

**1958 Nuclear Congress,** International Amphitheatre, Chicago, March 17-21.

**Society of the Plastics Industry,** 15th annual Pacific Coast section conference, El Mirador Hotel, Palm Springs, Calif., March 26-28.

**American Management Assn.;** discussion: private and governmental sources of financial aid for U.S. companies doing business abroad; Sheraton-Astor Hotel, New York, March 31-April 2.

**American Chemical Society,** California section, chemical exposition, Civic Center Exhibit Hall, San Francisco, April 13-17.

**American Society of Mechanical Engineers,** annual design engineering show, International Amphitheatre, Chicago, April 14-17.

**American Welding Society,** annual national spring meeting, Kiel Auditorium, St. Louis, April 15-17.

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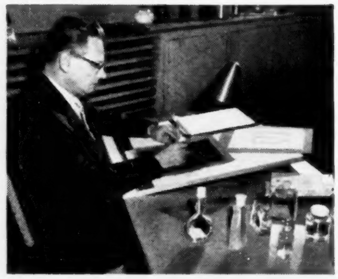

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**The Right Closure**

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**Needed Fitments**

O-I specialists are keenly aware of sales benefits derived from plastic shaker and pour-out fitments which are not "gadgets" but which increase consumer satisfaction with your product.


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Modern cartons are developed only through systematic consideration of their opportunity to serve you in the retail store and warehouse . . . as well as on your own filling line and in transit.



New convenience for liquid products! New *two-finger* handle by O-I . . . makes large-size containers so much easier for the housewife to use.

# Business
## Newsletter

CHEMICAL WEEK
March 8, 1958

**Two chemical companies are hiking their stake in rocketry** this week. Hercules Powder is forming a new chemical propulsion division and Thiokol Chemical is buying another rocket firm.

Hercules' new division will design, develop, produce and sell propulsion units ranging from those used in missiles and space vehicles to small, compact packaged power units. Research on propellents will continue at Hercules labs in Kenvil, N.J., and Wilmington, Del., with new plants to develop propellents reportedly already on the drawing boards.

And Thiokol, which a few weeks ago bought out Reaction Motors (*CW Business Newsletter, Feb. 8*), goes broader and deeper in missiles, with the purchase (for an undisclosed sum) of Hunter-Bristol Corp. (Bristol, Pa.), maker of rocket platforms and launchers.

•

**Meanwhile, emphasis on solid rocket fuels is growing fast.** Early this week, the Defense Dept. ordered the Air Force to develop long-range missiles using solid fuels. Up to now, solid propellents have powered only the smaller rockets.

For missiles still using liquids, the old stand-by oxidizer—liquid oxygen (lox)—may be on the way out. The Pentagon also is ordering the Air Force to work on developing a liquid oxidizer that could be more easily handled and stored than the temperamental lox.

•

**There's unexpected activity in synthetic fibers** (*see also p. 93*).

Beaunit Mills (New York)—parent company of rayon producers American Bemberg and North American Rayon—plans to start construction of a 10-million-lbs./year polymer staple fiber plant in Puerto Rico. Beaunit will buy resin—said to be a new type now in pilot production—from a U. S. concern. Construction of the plant will begin in about two months; the unit is due onstream in June '59.

•

**Latest earnings statements are sobering.**

Olin Mathieson reports '57 sales totaled $592.9 million, down less than 1% from those in '56. Net income, however, dropped nearly 20%, to $36.4 million.

Commercial Solvents actually lost money in the fourth quarter, and this pulled its 12-month net down to $1.5 million, off 51% from that of '56. Sales, on the other hand, were up more than 5%, to $65.9 million.

Minesota Mining & Mfg., bucking the trend, posted gains in both sales and earnings. Sales: $370.1 million, up 12%. After-tax net: $39.4 million, up 2.6%.

Victor Chemical boosted sales for the year to $52.2 million,

**Business**

**Newsletter**

**(Continued)**

4% higher than in '56. Earnings hit \$3.7 million, about the same as in the previous year.

American Potash & Chemical posted sales of \$42.8 million, up 2.6%. Earnings, though, skidded to \$4.7 million, about 8% less than the record profit level in '56.

**Against this background of faltering profits, reciprocal trade** again draws the attention of chemical industry spokesmen. Several will expound their views in the battle over extension of the Reciprocal Trade Agreements Act.

Appearing before the House Ways & Means Committee during the hearings that run to March 19 will be Earl McClintock, executive vice-president, Sterling Drug; J. D. Fennebresque, executive vice-president, Food Machinery and Chemical Corp.; Richard Hansen, representing Manufacturing Chemists' Assn. Synthetic Organic Chemical Manufacturers Assn. will also select a representative.

Their testimony is expected to have considerable impact on the committee's recommendations concerning the Administration-backed bill for limited tariff-cutting, inasmuch as the chemical industry is conceded to have a key role in defense production and to be particularly vulnerable to foreign competition.

•

**Reciprocal trade aside, U.S. chemical firms** are increasing their stake in overseas markets.

Standard Oil of California has just created a new sales concern, California Chemical International Inc., to take over the growing export business of its manufacturing subsidiary, Oronite Chemical. The new unit will be headquartered in San Francisco, with branch offices in Geneva, Switzerland and Panama City.

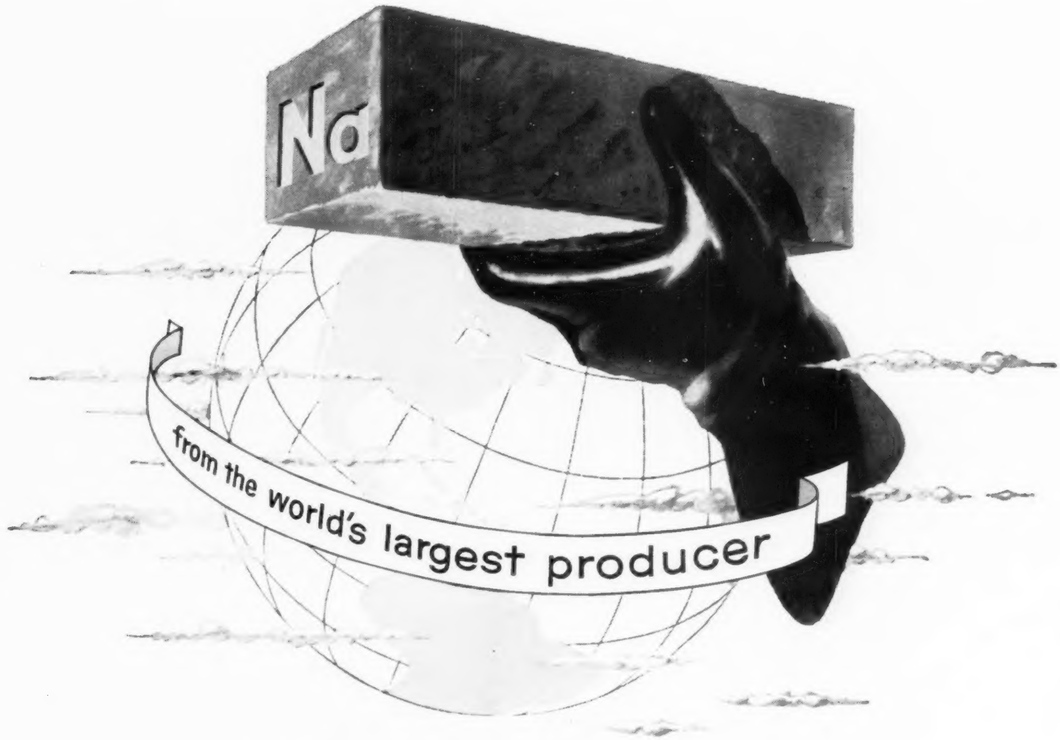
And in 3M's annual report out this week (*see above*), it's stated that the St. Paul company's international sales rose by more than 22% last year to \$66 million. Only five years ago, the total was less than \$20 million.

•

**Crown Zellerbach, seeking to avoid following an FTC order** that CZ give up its ownership of St. Helens Pulp & Paper Co. (*CW, Jan. 11, p. 22*), has filed a petition asking the courts to set aside the order. CZ attorneys assert that testimony by FTC's economists was based on a survey report that was "biased, incorrect, unreliable and inadmissable."

•

**For the chemical industries, there's optimism** concerning the near future as well as the next 17 years (*p. 35*). Says the Commerce Dept.'s Business & Defense Services Administration: Though business is sagging during their first quarter, "1958 as a whole is expected to be at least as good as 1957" for makers of chemicals and allied products.

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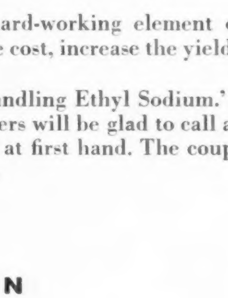


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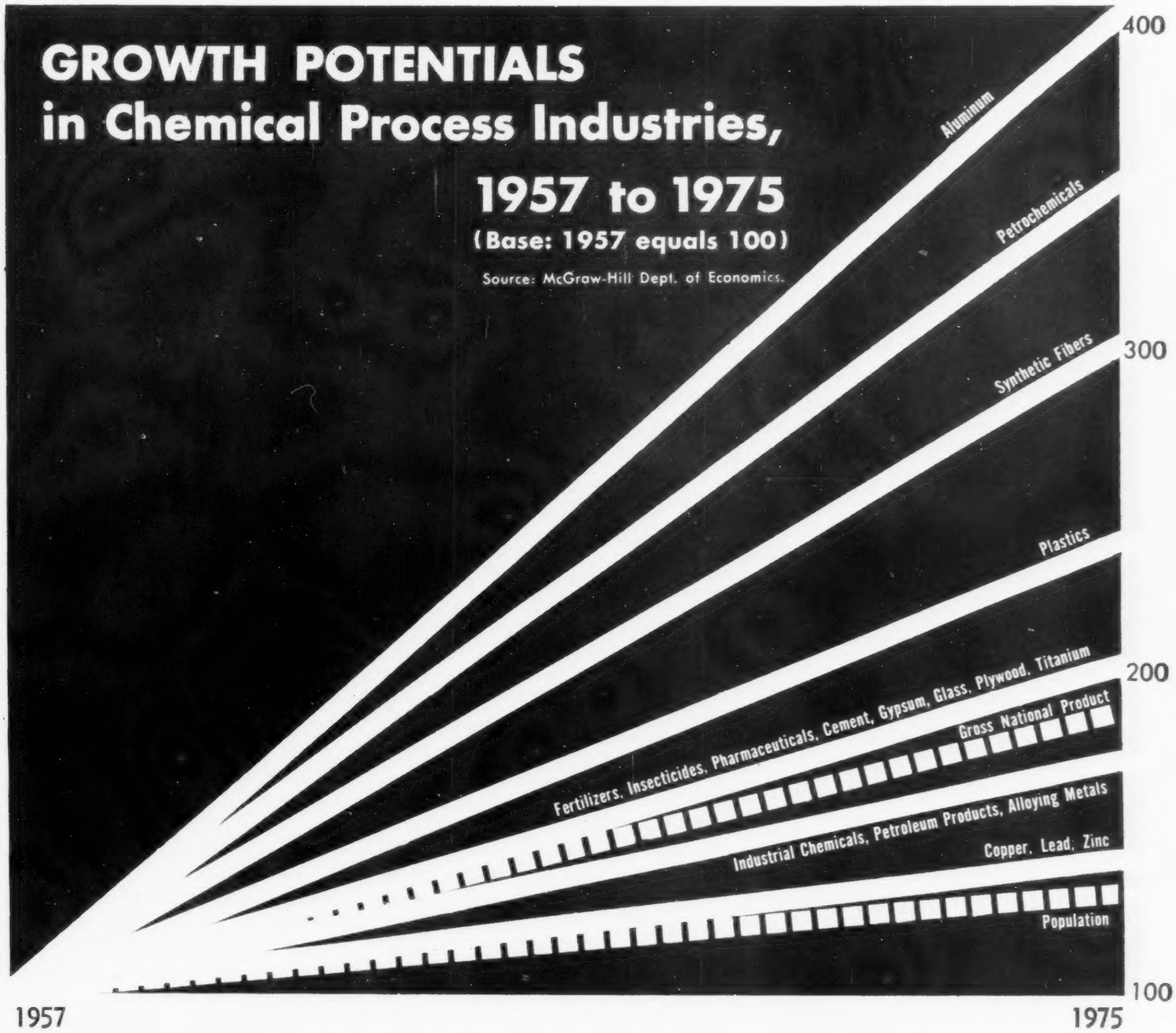


# Fast Growth Flavors 17-Year Outlook

**The small but solid gains made by chemical process industries last year (table, p. 36) are a stepping stone to advances—unmatched in general industry — that loom for the CPI in the coming 17 years (chart, above). That's the import of data disclosed last week.**

Preliminary figures compiled by federal agencies depict 1957 as a "topping-out" or leveling-off year for the CPI. The gains made in '57 are substantial; they suffer only when compared with the outstanding records of '56: sales up only 1.8%, compared with the 6.4% rise in the previous year; production up only one point, compared with the nearly seven-point climb on the Federal Reserve Board index from '55 to '56.

**Pickup Predicted:** The slowness of '57 is a marked contrast with what the McGraw-Hill Dept. of Economics sees in the way of potential for industrial growth between now and '75 (*CW Business Newsletter, March 1*). Much faster growth—particularly in certain favored product lines — is in store, assuming that these three established trends will continue:

- U.S. population will rise more than 1.5%/year.
- Gross national product will grow more than 3%/year.
- Continually improved technology —stemming from ever larger research

# 1957: BIG YEAR FOR SMALL GAINS

| | PRODUCTION | | | SALES | | | Year-end INVENTORIES | | | Year-end EMPLOYMENT | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1955 | 1956 | 1957* | 1955 | 1956 | 1957 | 1955 | 1956 | 1957 | 1955 | 1956 | 1957 |
| ALL MANUFACTURING | 140 | 144 | 145 | 316.1 | 332.5 | 340.6 | 46.6 | 52.5 | 53.7 | 13,473 | 13,350 | 12,477 |
| CHEMICAL PROCESS INDUSTRIES: | | | | | | | | | | | | |
| Chemicals and allied products | 167 | 177 | 184 | 21.4 | 22.8 | 23.4 | 3.2 | 3.6 | 3.9 | 556 | 547 | 525 |
| Products of petroleum and coal | 135 | 141 | 141 | 30.2 | 32.2 | 34.9 | 2.8 | 3.2 | 3.6 | 172 | 174 | 169 |
| Paper and allied products | 152 | 159 | 158 | 9.9 | 10.7 | 10.8 | 1.1 | 1.4 | 1.4 | 465 | 472 | 466 |
| Rubber Products | 143 | 133 | 135 | 5.7 | 5.6 | 5.8 | 1.2 | 1.3 | 1.3‡ | 227 | 216 | 207 |
| Nonferrous metals (primary) | 143 | 144 | 137** | 8.6 | 9.6 | 8.1** | 1.3 | 1.5 | 1.6‡ | 53 | 57 | 51 |
| Stone, clay and glass products | 149 | 158 | 155 | 8.7 | 9.0 | 8.5 | 1.0 | 1.2 | 1.3 | 470 | 465 | 436 |
| Stone and earth minerals† | 130 | 141 | 142 | (Not available) | | | (Not available) | | | 94 | 99 | 98 |

Production: Federal Reserve Board index of physical volume of production; 1947-49 average equals 100.
Sales: U.S. Dept. of Commerce compilations, in billion dollars.
Inventories: U.S. Dept. of Commerce and Securities & Exchange Commission compilations, in billion dollars.
Prices: U.S. Dept. of Labor wholesale commodity price indexes; 1947-49 average equals 100. Two industry definitions are different: "Petroleum and its products" instead of "Products of petroleum and coal"; and "Nonmetallic minerals, structural" instead of "Stone, clay and glass products."
Employment: U.S. Dept. of Labor compilations; numbers of production and maintenance workers, in thousands.
*Preliminary. **Estimated. †Includes mining of lime, salt, sulfur, phosphate rock, bauxite, potash, etc. ‡Sept. '57 instead of Dec. '57.

programs—will keep productivity rising about 2.5%/year.

The McGraw-Hill study makes these additional assumptions:

- "That we will be spared the total destruction that would result from a war with ballistic missiles carrying hydrogen-bomb warheads."
- That industry will not encounter any crippling shortages of basic resources over the next two decades.
- That the political climate will remain favorable to private enterprise.
- That progress in the peaceful conquest of space will have its first effects on the general economy by the early '70s.

**New Products' Potential:** New products are expected to account for much of the growth in the chemical process industries. With expanding research programs, it's probable that the number and market potential of new products will increase each year; but, even by '60, the impact of new products will be considerable.

What proportion of '60 sales will be accounted for by products that were not yet in production before '57? Outlook: all manufacturing, 10%; chemicals and allied products, 16%; pulp and paper, 9%; stone, clay and glass products, 8%; rubber products, 5%; nonferrous metals, 5%; petroleum refining and petrochemicals, 2%.

In backing up these forecasts, the McGraw-Hill economists point to records of the past few years: industrial research expenditures per year nearly doubled from \$3.7 billion in '53 to \$7.3 billion in '57; total research expenditures (including those by government, universities and foundations) have grown from less than \$1 billion in '42 to more than \$10 billion in '57 and "could easily reach \$15 billion" by '60. Sparked by such research spending, some industries have grown enormously in the past 10 years: plastics, 175%; aluminum, 200%.

But they also point to some criteria that reflect the generally weaker business scene since last summer. Process industry inventories were up about 7½% from Dec. '56 to Dec. '57; and employment veered downward. There had been a 0.3% dip in CPI employment of production and maintenance workers in '56; but '57 saw a 3.9% dropoff. In each year, however, process industry employment was notably more stable than the all-manufacturing average.

| Year-end PRICES | | |
|---|---|---|
| 1955 | 1956 | 1957 |
| 119.8 | 124.7 | 126.1 |
| 106.6 | 108.3 | 110.6 |
| 115.6 | 120.9 | 123.5 |
| 123.6 | 128.0 | 131.0 |
| 151.0 | 147.9 | 130.6 |
| 155.8 | 149.6 | 130.6 |
| 125.4 | 131.3 | 135.7 |
| (Not available) | | |

**Process Equipment Boom:** Authors of the report conclude that "bright growth prospects for the oil and chemical industries indicate a large demand for chemical process equipment." Makers of such equipment will also benefit from the trend toward greater utilization of by-products and chemical wastes.

The economists emphasize that there's no guarantee that long-term growth potentials will be realized. Failure to do successful short-range planning, for example, can cripple a company's chances, they state. But with technology advancing "at a speed that has not been matched in any country at any time," it's a fair guess that chemical process companies will have first crack at some of the "extraordinary potentials for growth" that the economists foresee.

# At Issue: Atomic Profits

**Which steps of uranium processing should be made profitable to private industry—and how much so? These are the questions before the current hearings on the roles of government and industry in the U.S. atomic energy program. And private industry spokesmen are turning up on all sides of the controversy.**

Some industry witnesses have been telling the Congressional Joint Committee on Atomic Energy that their companies can't continue their nuclear activities without more federal help; others say that governmental subsidies can now be cut—or even eliminated.

Michael Michaelis—senior atomic energy consultant for Arthur D. Little, Inc.—came to the committee with a suggestion of higher subsidies now as a means of reaching a point at which the atomic energy industry could be self-sustaining. Blaming high uranium costs for lack of progress in atomic power, Michaelis called for the U.S. government to guarantee a low price on nuclear fuel.

**Temporary Drop in Incentive:** But, Michaelis conceded that by lowering nuclear fuel costs to electric utilities, the government would temporarily remove any profit incentive for industry to enter the government-operated segments of the fuel business.

That's relatively unimportant, he says, because limited commercial demand for nuclear fuel now provides an inadequate incentive anyway. "And, it will be more than offset by the increased demand for fuel services created by the accelerated reactor program." As the demand grows, industry will enter the fuel business on a realistic, privately financed basis. The government can then withdraw.

Another proposal aimed at increasing the demand for nuclear materials comes from Vice-President Chauncey Starr, of North American Aviation. He, too, advocates governmental subsidies to lower the price of reactor fuels.

Suggesting that U.S. policy and prestige would be furthered by spurring atomic power development abroad, he proposes that foreign companies be allowed to buy nuclear equipment here at prices they would pay for conventional power units, with the U.S. government making up the difference.

**Sell Only the Heat:** Under Starr's plan, the U.S. would provide fuel elements for those plants, retaining ownership of the fuel but selling the heat produced at conventional energy prices. Total cost: $160 million over a 10-year period.

President Lee Davenport, of Sylvania-Corning Nuclear Corp., offers a plan for a new "partnership" between government and industry, with a minimum of government control. He deplores what he calls "a marked imbalance" between the number of companies in the nuclear field and the business available. This situation, he charges, "has developed a buyer's market so strong that unwise and uneconomic commitments are widely accepted in our industry."

Consequently, he adds, "an increasing number of responsible firms have already terminated or announced their intention to terminate their nuclear activities. This has created, and will continue to foster, an unhealthy base for our industry."

**Davenport's recommendations:**

- An integrated plan to develop nuclear power "economically competitive with other sources of power."
- Construction of five to 10 nuclear reactors in the U.S. within five years.
- Five-year (or less) depreciation on nuclear plants authorized by Atomic Energy Commission.

Michaelis: It's too soon to encourage private nuclear fuel production.


Aerojet's Kimball: Relying on chemicals for more nonmilitary sales.

## Top-Heavy on Defense

**Aerojet-General Corp. (Azusa, Calif.) is looking forward to record '58 profits and even bigger percentage gains later on. And for these advances, it is relying more and more on its chemical interests.**

That's the outlook sketched by company President Dan Kimball at last week's meeting of the New York Society of Security Analysts. Kimball told the Wall Street group that '58 sales would top $180 million, with profits in the $4.2-million to $4.3-million range—compared with last year's figures of $161 million and $3.8 million.

The firm now has 250 government contracts covering 500 projects—most of them on research and development of rocket engines, fuels and components. But the aim, says Kimball, is to get more industrial customers. In '56 government work accounted for 94% of sales; in '57, 88%.

Some of the nonmilitary products Aerojet will push are infrared refractors and reflectors, structural plastics and—on a production line basis—small nuclear reactors for universities and hospitals.

Also on tap for this year: a 10-for-1 stock split, sometime in April. But there's to be no change in the no-dividend policy. For the next two or three years, Kimball says, profits will be put back into the business for working capital and expansion fund.

## Easing Up on Wages

**The bargaining policy committee of Oil, Chemical & Atomic Workers Union (AFL-CIO) made its '58 objectives clear last week. It's advising OCAW locals to concentrate on job security and union security in this year's negotiations.**

Wage recommendations coming out of the committee's Denver meeting are relatively moderate, considering that OCAW's usual policy has been to open bargaining by stating a large "asking price." This year, OCAW locals are being told to seek a wage increase in two parts:

- An increase equal to the rise in cost-of-living since the local's last previous wage increase.
- An increase of 3.5%/year, which OCAW figures is the rate of increase in productivity in the entire U.S. economy.

To mitigate layoff hardships and to bolster the status of local unions, the committee is urging affiliates:

- To seek two-year or three-year contracts, rather than one-year agreements.
- To get provisions for "substantial" severance allowances.
- To obtain in each new contract a clause requiring an employer to notify the union four months in advance of any proposed large-scale layoff, and permitting the union to reopen the contract for bargaining on wages and hours following such notice.

Though the committee's recommendations are described as "mandatory" for OCAW's petroleum locals, they are optional for its other affiliates.

**Anxious Moment:** While OCAW was drawing up this new bargaining program, a nonchemical union was causing some anxiety among chemical producers in Ohio and West Virginia. Utility Workers Union of America (AFL-CIO) launched a strike at the Ohio Valley Electric Corp.'s Kyger Creek station (which supplies power to the Atomic Energy Commission's gaseous diffusion plant near Portsmouth, O.) and threatened to call "sympathy strikes" at generating stations of OVEC's 15 sponsoring companies.

But it appears that—for the present, at least—there'll be no reduction in available electric power to chemical plants in the Ohio River and Kanawha River valleys.


Argentina's Frondizi: For chemical industry, a favored status.

## 'Hands Off' Chemicals

**U.S. chemical and pharmaceutical firms—which led the hesitant return of foreign capital to Argentina after dictator Juan Peron's ouster in '55—may have less cause for concern than other industries, in the wake of last week's election.**

Generally, consensus among businessmen is that U.S. interests in that country took a body blow as some 8 million Argentines went to the polls Feb. 23 and elected Peron-backed Arturo Frondizi president. But Frondizi feels that chemicals are one industry better left to private enterprise.

The candidate of the "leftist" Intransigent Radical Party swept into office on a platform of ultranationalism and anti-imperialism, propelled by a block of 1.5 million Peronist votes and minor Communist support.

Frondizi has pledged himself to state ownership of basic industries. While he "welcomes" foreign capital, he insists on strict—but still undefined—controls.

In quick reaction to the lawyer-politician's victory, the peso's artificially propped value dropped from 37.5 to 40.5/dollar.

When he takes office May 1, Frondizi will face a storm of demands from his supporters, and a sea of problems that include general strikes, unemployment, inflation and a mounting trade deficit. His election commitments won't make his job easier.

## FOREIGN

**Chemicals/Australia:** Monsanto Chemicals (Australia) Ltd. will buy two subsidiaries of Drug Houses of Australia (Melbourne). The subsidiaries are Beetle Elliott Pty., Ltd., producer of phenolic, urea and melamine molding powders, polyvinyl acetate emulsions, and other plastic materials; and D.H.A. (Chemicals), which produces sulfuric acid, inorganic salts and agricultural chemicals. Principal shareholders of Monsanto Chemicals (Australia) are Monsanto Chemicals Ltd. (England) and Monsanto Chemical Co. (St. Louis).

•

**Chemicals/Czechoslovakia:** Czechoslovakia expects to boost chemical production 9.3% this year, compared with a planned 8% increase for total industrial output. In '57, the Czechs turned out 74,000 tons of nitrogenous fertilizer, 110,000 tons of phosphate fertilizer, and 445,000 tons of hydrochloric acid. Production of engine fuels increased 32%.

By 1970, Czechoslovakia plans to build 10 atomic power stations with a total capacity of 5,000 megawatts. Construction of the first station is slated to start during the second half of this year.

•

**Petrochemicals/France:** Esso Standard Societe Anonyme Francaise will expand refining and petrochemical facilities at its Port Jerome (France) refinery. New units include a detergent alkylate plant, a plant for ethylene, butadiene and other raw materials, and a lubricating oils plant. Propane dewaxing expansion is also planned. The plant will be designed and built by Foster Wheeler.

## COMPANIES

**Monsanto Chemical Co.** (St. Louis) has purchased the physical assets of Filtered Rosin Products, Inc. (Baxley, Ga.). Included are plants at Baxley, Douglas and Alamo (all in Georgia) for gum collection and gum rosin, turpentine, and paper size production. The Georgia firm had been manufacturing fortified rosin for Monsanto. Now, it will form a separate Monsanto unit. New name: Filtered Rosin Co.

With Emery Industries, Inc. (Cincinnati), Monsanto is building a $4-million tall-oil fractionation plant at Nitro, W.Va.

•

**Tin:** The Wah Chang Corp. (New York) is getting ready to start smelting tin at the only tin smelter in the U.S., the 20,000-tons/year plant in Texas City. The firm purchased the $13-million smelting plant from the government in '57 for $1.35 million. This month, a trial shipment of tin ore will arrive at the plant from Indonesia. The U.S. consumes about 60,000 tons of primary tin a year; two-thirds of this now comes from Malaya.

**Olin Mathieson Chemical Corp.** will call in all outstanding convertible preferred stock and two subordinate debenture issues. The firm plans to finance the refund with a new 40-million issue of convertible subordinate debentures. The issues were originally offered by Mathieson Chemical Corp. in '51 and '52, before the merger with Olin Industries in '54. Now, Olin Mathieson finds the restrictive covenants, particularly on funded debt limitations, "unrealistic" for a firm of its present size.

•

**Lawter Chemicals, Inc.** (Chicago), has acquired Krumbhaar Chemicals, Inc. (S. Kearny, N.J.). Lawter makes alkyd resins, printing ink vehicles, and fluorescent products. The Krumbhaar purchase will add to its line synthetic resins and phenolics. Krumbhaar will continue to operate under its present name.

•

**Universal Oil Products Co.** securities—which are the major asset in the American Chemical Society's Petroleum Research Fund—are one step closer toward being sold. A revised plan for offering the $50 million worth of stocks and notes was approved last week by a New York supreme court referee. Guaranty Trust Co.—as trustee for the fund—has been seeking permission to sell the UOP stock in order to diversify the fund's portfolio.

The revised petition provided that not more than 2% of the stock will be sold to any individual other than institutional investors.

## EXPANSION

**Rocket Fuels:** Thiokol Chemical Co. is planning to expand its Brigham City, Utah, solid-fuel engine plant 25%. The addition will cost $750,000 to $1 million.

•

**Aromatics:** The Texas Co. will add a 7,500-bbls./-day Udex unit to its Wilmington, Calif., refinery. Construction will start in May, is slated for completion in Feb. '59.

•

**Glass Fiber:** Pittsburgh Plate Glass Co. has broken ground for a 25-million-lbs./year glass-fiber yarn plant near Shelby, N.C. PPG hopes to have the first two of 16 glass furnaces in production by spring of '59, have the rest operating in another 18 months.

•

**Pulp & Paper:** The Boise Cascade Corp. (Boise, Idaho) will build a pulp- and papermill at Wallula, Wash. Estimated cost: $15 million. The plant will supply kraft pulp for a container plant already under construction.

•

**Ink:** The Howard Flint Ink Co. (Detroit) will establish a $250,000 printers' ink plant in Jacksonville, Fla. Operations are expected to start this summer.

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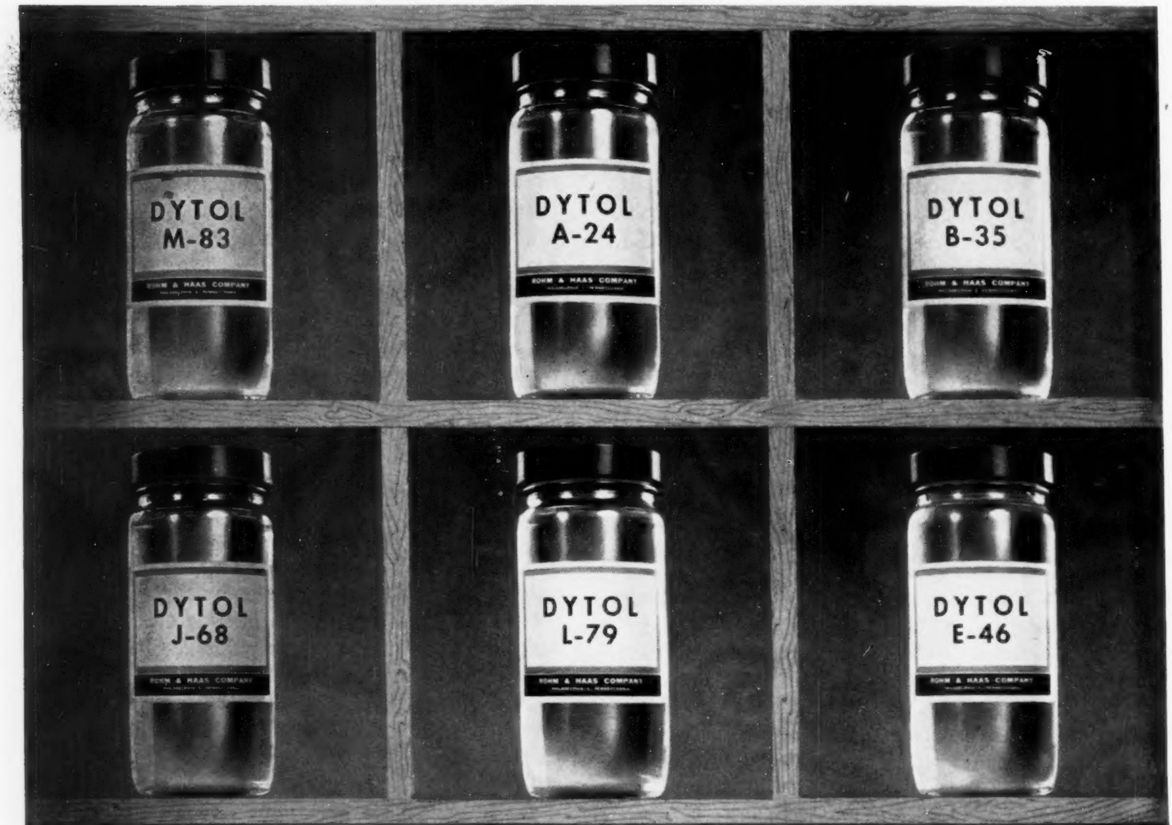


| | DYTOL M-83 (octyl) | DYTOL A-24 (lauryl) | DYTOL B-35 • (lauryl) | DYTOL J-68 (lauryl) | DYTOL L-79 (lauryl) | DYTOL E-46 (cetyl-stearyl) |
|---|---|---|---|---|---|---|
| Octyl $C_8$ | 98.0% | none | none | none | none | none |
| Decyl $C_{10}$ | 2.0 | 1.5% | 1.5% | 1.0% | none | none |
| Lauryl $C_{12}$ | none | 71.0 | 60.0 | 82.0 | 98.0% | none |
| Myristyl $C_{14}$ | none | 27.0 | 25.0 | 17.0 | 2.0 | 1.2% |
| Cetyl $C_{16}$ | none | 0.5 | 13.0 | none | none | 34.0 |
| Stearyl $C_{18}$ | none | none | 0.5 | none | none | 64.8 |

*Typical alcohol compositions as determined by fractional distillation.*

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# Washington Newsletter

CHEMICAL WEEK
March 8, 1958

**Washington is anxiously looking for signs** of the seasonal spring lift in business. Between now and mid-April, key indicators will show whether current antirecession policies will stand, or whether they'll be augmented—probably by a tax cut.

Here are the signals Administration officials will be watching with particular care:

**Industry intentions to spend for new plant and equipment.** This will be out soon, probably next week. It's the first government survey of investment plans for 1958 as a whole. The Administration is counting on increased spending by industry later this year.

**Consumer attitudes.** This survey, sponsored by the Federal Reserve Board, will be published late this month or early in April. It will show whether consumers intend to keep up the current brisk rate of buying.

**Industrial production.** This Federal Reserve index dropped three points for January, probably will show another drop in February when the figures for that month are released next week. The index for March—coming early in April—is the one Administration officials are most concerned about.

**Unemployment.** This is the most politically sensitive of the key indicators; made all the hotter this year when President Eisenhower picked it as the one he expects to turn up this month. Figures released in the next week or 10 days will be for February; the March trend won't be known until mid-April.

•

**Senator Kefauver may soon be recommending** an anti-"price leader" law. Kefauver (D., Tenn.), chairman of the Senate Antitrust & Monopoly Subcommittee, thinks this might be one way to get price competition in concentrated industries—which he charges is now either absent or "rare."

Kefauver's principal targets are steel and automobiles. Others will be picked up as his subcommittee continues its so-called "administered price" hearings.

Kefauver says the practice of following the price lead of the dominant company in a concentrated industry—though apparently not a violation of existing laws—fixes prices just as effectively as illegal price-fixing conspiracies. He wants more hearings to determine if new legislation is necessary.

A report just issued by his subcommittee sharply criticizes steel industry pricing policies. It attacks—but makes no legislative proposals to deal with—concentration, administered pricing and price leadership.

# Washington

## Newsletter

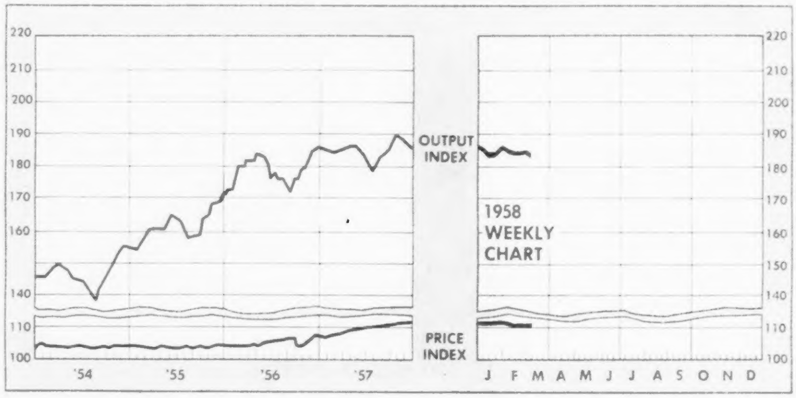
(Continued)

**Results of AEC's first underground blast by a small atomic bomb** gives officials of that agency high hopes for a variety of revolutionary peacetime uses. They say they will be able to put the devastating blasts to work breaking up underground formations for oil or mining companies, for producing steam in remote areas, for speeding excavations for harbors or canals.

AEC Commissioner Libby wonders what chemical reactions might be produced if such a blast were set off in a vein of coal or oil shale. Libby admits no one knows the answer yet, but he thinks it might prove possible to gasify coal or shale and produce a variety of chemical reactions —depending on the type of formation in which the blast is made.

Already-confirmed experience with a mountain-shaking blast made last September indicates another shot can be tried soon, say for oil recovery or harbor dredging. The first test—dubbed Ranier—was a joint AEC-Pentagon project designed primarily to determine whether A-bomb tests could be conducted underground, thus avoiding many of the problems that stem from dangerous atomic fallout.

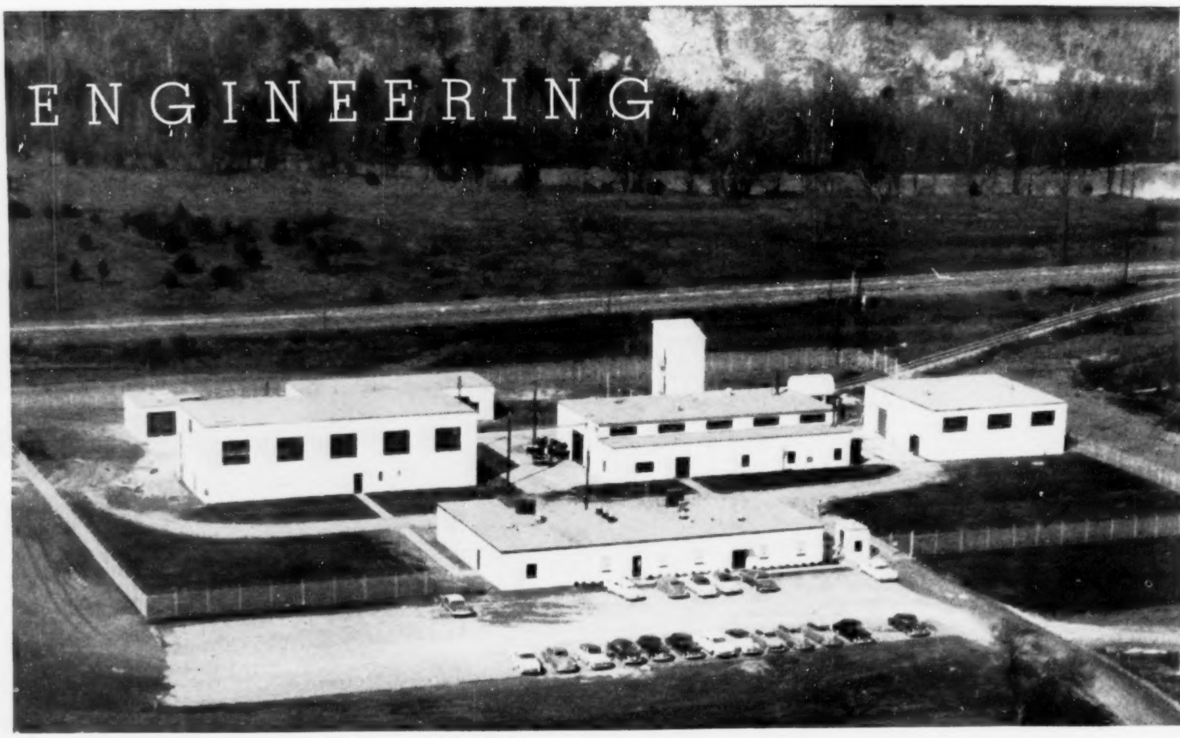
The 1.7-kiloton bomb blast, 800-ft. below the surface of a Nevada mesa, crushed 400,000 tons of rock in an area 130 ft. in diameter. A bubble of vaporized rock 5 ft. in diameter was created for an instant. When the bubble collapsed, it left 700 tons of radioactive rock in a saucer-like formation about 55 ft. in diameter. Days after the explosion, the entire region was still heated to a temperature 130 C above normal.




# Business Indicators

| WEEKLY | Latest Week | Preceding Week | Year Ago |
|---|---|---|---|
| **Chemical Week** output index (1947-49=100) | 182.5 | 183.5 | 185.5 |
| **Chemical Week** wholesale price index (1947=100) | 111.0 | 110.9 | 108.6 |
| Stock price index of 11 chemical companies (Standard & Poor's Corp.) | 39.14 | 39.53 | 40.91 |

| MONTHLY<br>Wholesale Prices (Index 1947-1949=100) | Latest Month | Preceding Month | Year Ago |
|---|---|---|---|
| All commodities (other than farm and foods) | 126.0 | 126.1 | 125.2 |
| Chemicals and allied products | 110.6 | 110.6 | 108.7 |
| Industrial chemicals | 123.9 | 123.9 | 123.5 |



**Davison teams metal, chemical and ceramic processing areas (background, l. to r.) in fuel element plant.**

# Industry Builds an Integrated A-Fuel Plant

**At Erwin, Tenn., in the foothills of the Great Smoky Mountains, Davison Chemical Co. (Baltimore, Md.) this week unveils its newly completed nuclear reactor feed materials plant.**

The first completely integrated nuclear fuel plant constructed by private industry, it features processing flexibility sufficient to produce all of the thorium and uranium products required by the budding commercial nuclear power industry.

By offering several materials that were previously available only from AEC, Davison is narrowing the gap between primary producers of thorium and uranium raw materials and the ultimate industrial consumers. In addition, the company will take on another long-awaited service—the commercial reprocessing of fuel fabricators' scrap.

**Commercial Versatility:** Despite the modest proportions of the Erwin plant, which represents an investment of nearly $2 million, its three processing areas are equipped to perform nearly all feed material functions. Processes employed by Davison are based on conventional techniques, all of which received extensive development in AEC facilities.

Because the commercial nuclear industry is still, for the most part, in the research and development stage, Davison has geared its feed materials operations to handle the widest possible variety of product demands. As a result of this planned flexibility, the plant can turn out both natural and enriched uranium oxides, uranium tetrafluoride, the metal and its alloys; thorium in the form of oxides, nitrate, metals and alloys; and mixed thorium-uranium oxide ceramic fuels.

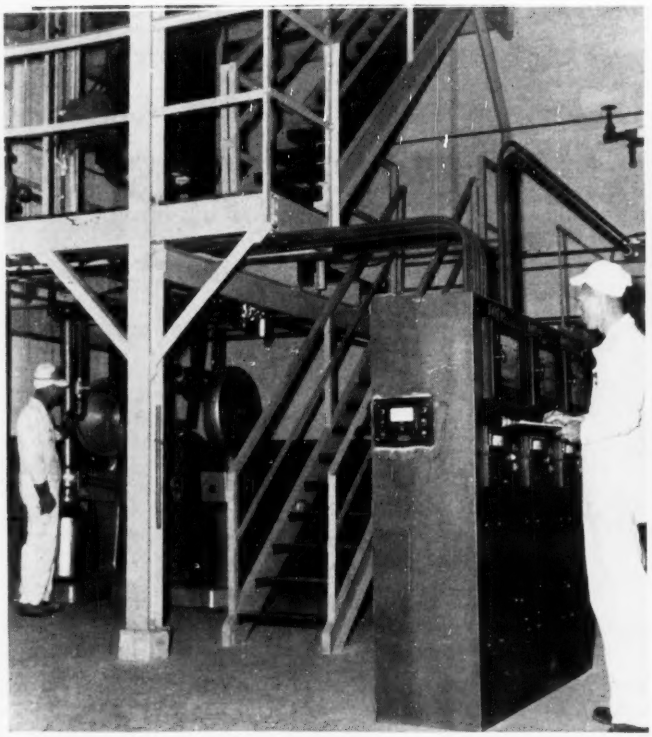
Processing know-how is supplied by an experienced management team headed by General Manager T. C. Runion, who has spent 12 years in development and production in the atomic energy field. And to keep its new operation abreast of the fast-moving developments in the nuclear industry, Davison can call upon all the facilities of its corporate parent, W. R. Grace & Co.

**Process Line-up:** Uranium raw materials received at Erwin can be processed by several routes. The preferred method of producing natural or low-enriched uranium metal from uranium hexafluoride is by the dry process employed in the metals building.

The hexafluoride as supplied in the desired enrichment from the Oak Ridge gaseous diffusion plant is reduced by hydrogen at 1200 F to produce "green salt" ($UF_4$). The by-product hydrogen fluoride is presently precipitated and discharged as waste; it may later be recovered for reuse.

Green salt is reduced to metal by reduction with magnesium or calcium

**Vacuum furnace turns out ingots.**



**Uranium hexafluoride reduction (left) yields tetrafluoride for reduction to metal (right).**

metal in sealed, induction-heated "bombs." The resulting "biscuits" are then cast into uranium ingot by vacuum-induction or vacuum-arc melting. The impurity-laden outer skin of the ingots is machined off.

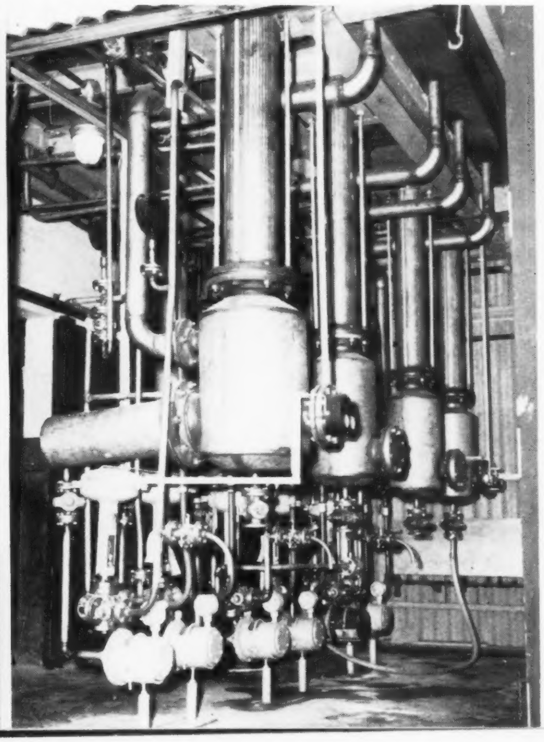
Green salt may also be reacted with steam to make uranium dioxide ($UO_2$).

**Wet Processing:** In the chemical building, hexafluoride is converted into the dioxide by the ammonium diuranate (ADU) process.* This method starts by reacting $UF_6$ with water or steam to produce uranyl fluoride in solution or in powder form. Subsequent treatment with ammonia yields the diuranate, which is then decomposed to black oxide ($U_3O_8$) by heating. Hydrogen reduction of the black oxide converts it into the dioxide ($UO_2$) used in ceramic fuels. The process by which the oxide is made determines the characteristics of the cermet.

Intermediate- and high-enriched uranium will be handled by the batch ADU method since criticality limits

*Mallinckrodt, who was the first commercial producer of uranium oxide fuel, uses the ADU process in its Hematite, Mo., plant (*CW, Oct. 27, '56, p. 106*).

**In chemical building, concentrates are digested (left), solvent-extracted in pulsed columns (right).**



**Dust-tight hoods assure safe handling of oxides, ceramics.**

quantities of material in process to laboratory-scale equipment (maximum permitted solution volume is 1 liter).

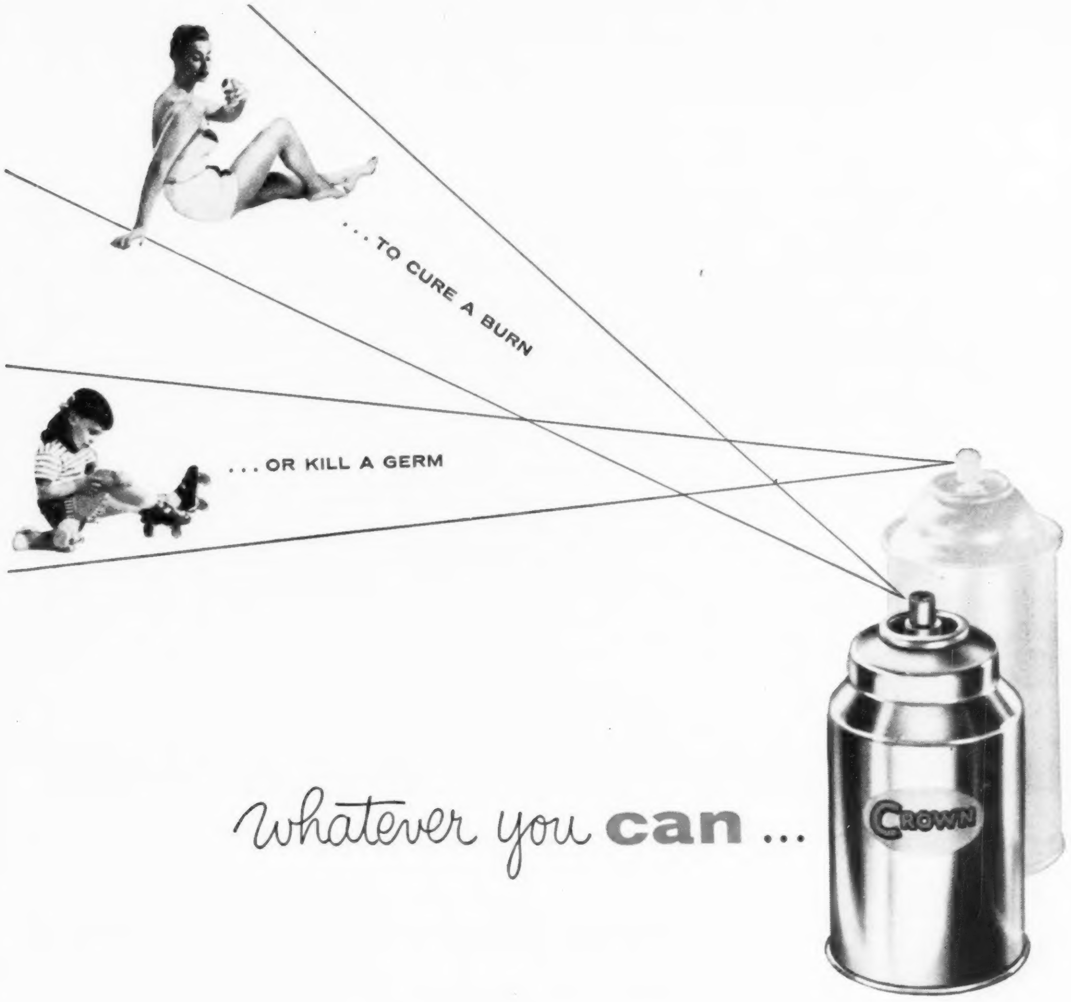
Largest equipment in the chemical building is the digestion and solvent extraction system used for the extraction and purification of thorium concentrates from Davison's Curtis Bay, Md., plant (*CW, July 14, '56, p. 68*). This concentrate is first digested in nitric acid, then solvent-extracted in four 6-in.-diameter, 40-ft.-tall pulsed columns (two columns for extraction, two for stripping thorium out of the solvent). Purified thorium is precipitated with oxalic acid; the oxalate is fired to produce thorium oxide for use in ceramic fuels, or for reduction to thorium metal.

Existing solvent extraction equipment will also be used for low-enriched uranium scrap recovery. To handle high-enriched scrap, Davison will install three 2-in.-diameter pulsed columns that meet criticality standards.

Blending, pelletizing and sintering of thorium and uranium oxides is done in the ceramics building. Finished products are shipped in bulk to fuel fabricators or, as Davison is currently doing for one customer, loaded and sealed in fuel element tubes provided by the fabricator. Shipping containers are specially designed to insure safe handling, to prevent inadvertent arrangement of a critical mass.

**Custom Business:** Capacity of the Erwin plant, says Runion, is enough to handle about two-thirds to three-quarters of the available commercial nuclear fuel business. But even at full capacity, the plant will need all the flexibility it can muster to custom-make feed materials to the varied specifications of all potential commercial users.

**Assembled fuel elements are shipped in 'birdcage' containers.**

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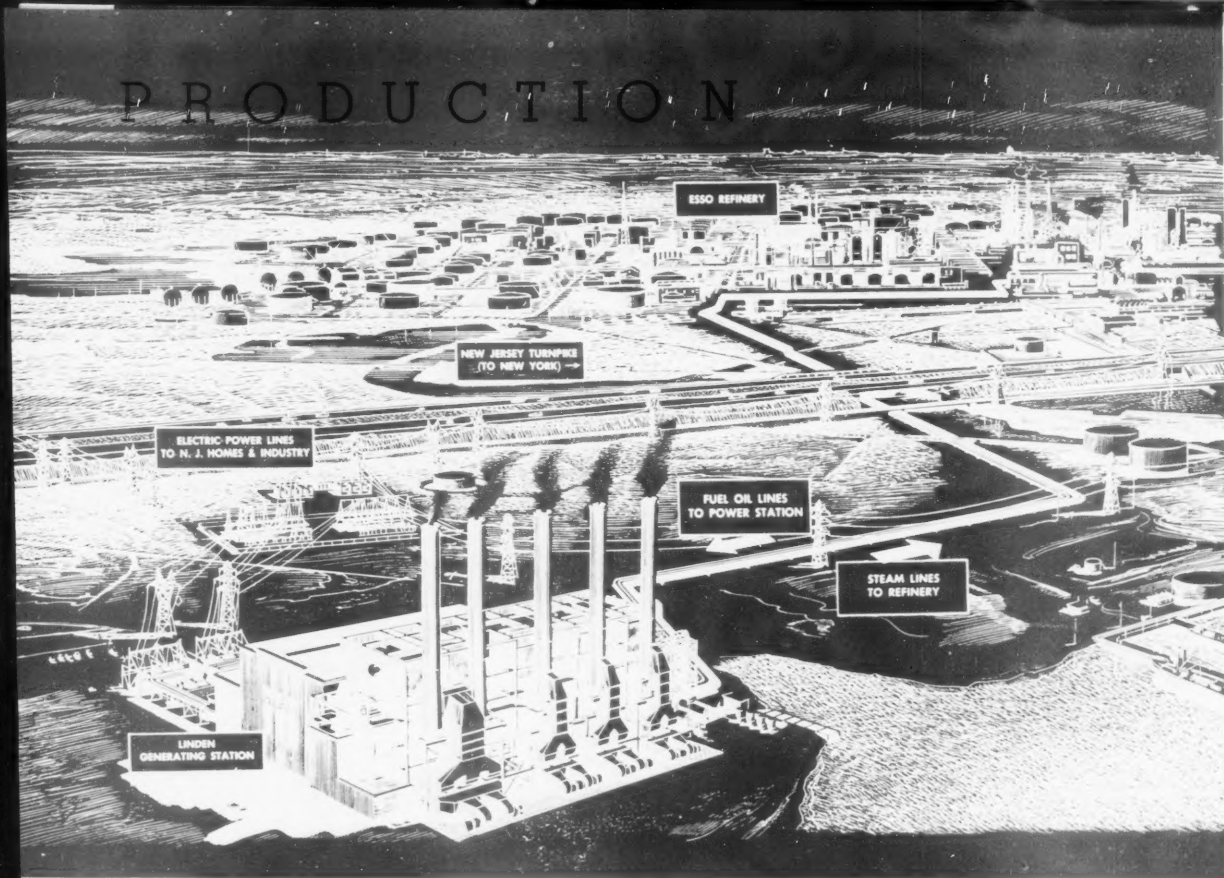



**PSE&G shoots electricity, steam across Jersey Meadows into Esso's newly converted power system.**

# Refinery Hookup Paces High-Voltage Trend

**Spanning the salt marshes of the New Jersey "Meadows" for three-quarters of a mile between Public Service Electric & Gas Co.'s new, near-complete Linden, N.J., power station and Esso Standard Oil Co.'s sprawling Bayway refinery are four 6,300-ft. runs of steam pipeline (see drawing, above) and three high-voltage electric power lines. They are the arteries that supply power to the refinery, making possible a new kind of power conversion program that Esso says is as complete this week as any program of its type ever will be.**

The project: conversion of the refinery's electrical system from a 6,900-volt to a 27,000-volt system. It makes Bayway the pacemaker of a general trend by industry toward use of higher-voltage electrical systems. Although some plants have converted to 13,800-v. systems, few have thought of going as high as 27,000.

**Outmoded System:** The conversion to the higher-voltage system has taken about three years. But the necessity and the plans to convert were many years in the making.

In addition to a general expansion, there has been a gradual shift from steam to electricity for the refinery's rotary driving equipment—more than 4,000 pumps, compressors, etc. This has resulted in the need for greatly increased electrical capacity.

The shift in type of power has been from steam drivers and stand-by equipment, first to electrical drivers with steam stand-bys, then to the present-day electrical drivers and stand-bys. It started before World War II with the improved reliability of electrically powered equipment. For example, at one time, steam reciprocating pumps were most reliable for moving heavy products. Then electric-driven centrifugals were improved to the point where they could do a better job.

During the war, it was necessary to have alternate sources of power. But since the war, the pace of chane-over to electric-only equipment has been accelerated. Advantages: electrical drivers can provide more power and efficiency at lower cost, and maintenance is simpler.

When steam stand-by drivers are used, they must be turned over periodically to avoid freeze-up. Not so with electric motors. Actually, the biggest part of electrical maintenance is not electrical—it's lubrication, Esso says. A common lubricant usually can be used. But with steam, several different lubricants are often needed. For example, the different temperature stages of steam turbines require different lubricants.

**New Processing Equipment:** Increased availability of electricity at the refinery is leading to use of new types of equipment. For example, Bayway's new Powerformer and alkylation units have been designed with some air coolers instead of water coolers. Thus, additional cooling water does not have to be pumped from the Arthur Kill (an arm of New York Bay that separates Staten Island from New Jersey). This also removes the salt water corrosion problem, and cuts the cost of energy. In addition, the over-all expense of the air cooler and its installation was less than that of a conventional heat exchanger. Another plus: the increased availability of electricity helps the adoption of automated processing where it is essential.

**Tough Decision:** Despite these gains, the decision to convert to a very high-voltage system was a tough one for the refinery management to make—particularly so six years ago, when Esso's consideration of 27,000 v. was almost without precedent. The 6,900-v. system had been in operation for many years. The easiest and cheapest thing to do would have been to add to it—the first part of a conversion is always uneconomical. But Esso realized that, eventually, adding to the old system would make it too cumbersome, uneconomical.

The firm justified switching to the new higher-voltage system by looking ahead, trying to determine the electrical requirements within a decade.

Switching from 6,900 to 27,000 volts meant several extra advantages. There's a need for fewer substations. Moreover, Bayway now gets the same amount of energy at higher voltage using smaller cable—so, losses are smaller. And with the new system, a 4,000-hp. motor can be started with less than 1% voltage drop for the 20 seconds the motor takes to reach speed.

But other factors had to be considered. For instance, switchgear for stepping the 27,000 v. down to the 2,300 and 440 v., on which most of the equipment runs is not easy to obtain on short notice. In fact, equipment makers are still working on switchgear that can safely be placed indoors. Equipment for 13,800-v. systems, on the other hand, is much more common, can be placed indoors. Nevertheless, other Esso refineries that had already gone to 13,800-v. said the higher voltages would be desirable.

**Secondary System:** For the conversion, a secondary selective feeder system had to be devised. When a power failure occurs, a switch must be made to duplicate equipment on stand-by. Rotating equipment, halted by the power failure, must be restarted. But starting load is so great that only about 40% of the motors can be accelerated. Esso had to decide at the outset what units to include in this 40%. All unessential equipment had to be cut out until essential equipment had been accelerated.

**New Power Source:** To handle the power load—Bayway's consumption averages about 40,000 kw./hour—a new power plant was required. Esso found the situation of 20 years ago no longer pertained—it could buy electricity more economically than it could generate its own, as had been the case then.

Esso tied in with the Public Service Electric & Gas system about two years ago. To handle local needs, PSE&G has been putting up the adjacent Linden power station (which will add its remaining capacity to its public power distribution system). The first Linden generator went onstream last summer, the second in December, and the station is still abuilding.

But a source of steam for process heat was required because Esso's power plant was no longer being operated. Process systems generate some heat of their own, have internal heat balances with accompanying waste-heat boilers. This heat is free, but it isn't enough.

Again, PSE&G provided the solution. About 400,000 lbs./hour of 750-psi. steam and 350,000 lbs./hour of 150-psi. steam are sent from the Linden station to Esso's boiler house for transfer into the refinery steam distribution system. (This arrangement also makes PSE&G's power plant operations more efficient.)

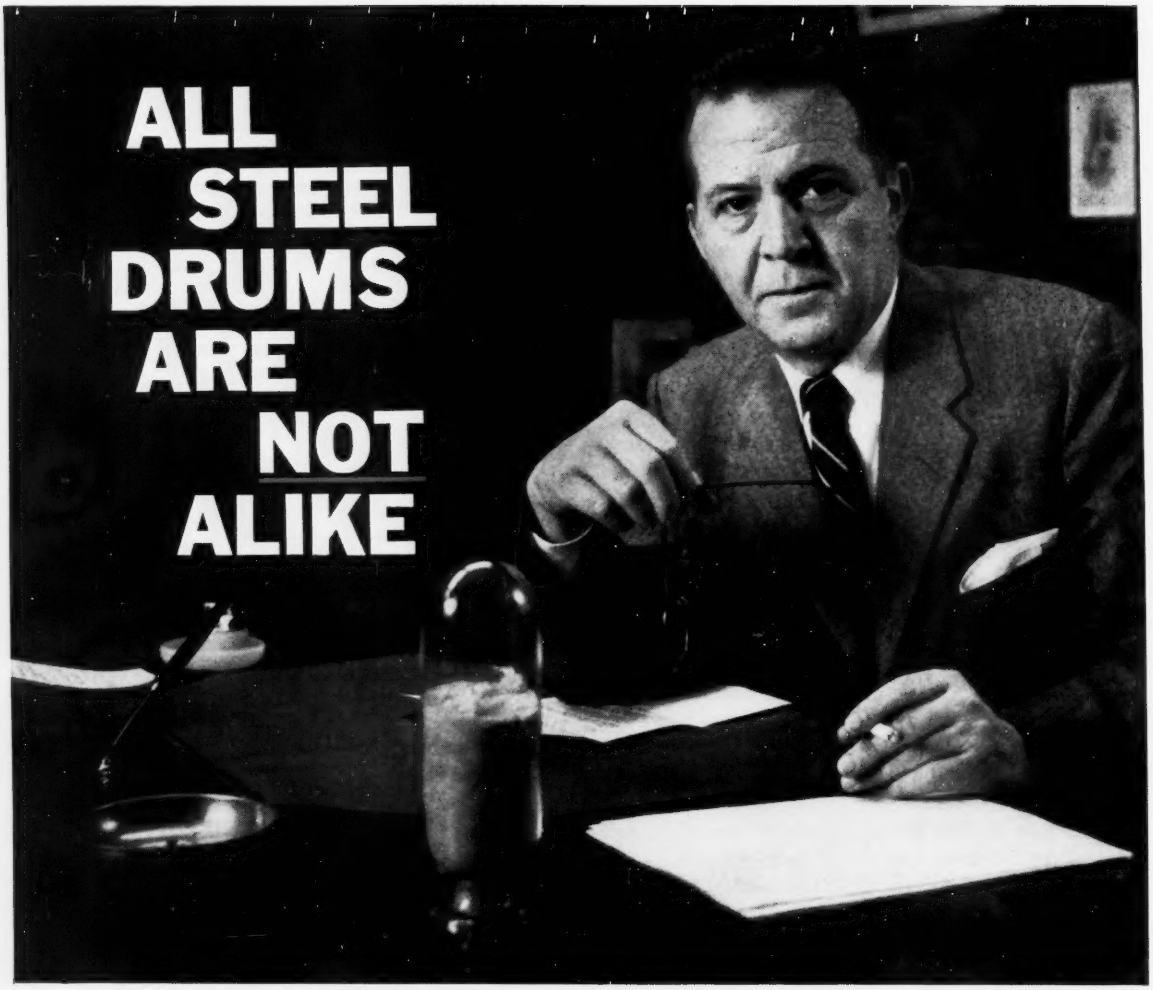
**Nothing New:** Such a setup to buy both steam and electricity isn't new. Du Pont's giant Chambers Works is believed to be the first to have had such a setup; it has been linked with Atlantic City Electric Co.'s Deepwater station since 1930 for the two. Another Du Pont plant, the Repauno Works, near Gibbstown, N.J., has been tied in with ACE's Greenwich station for steam, electricity and water pumping since 1952.

Delaware Power & Light Co. and Tidewater Oil Co. have a similar arrangement at Delaware City.

In the Esso-PSE&G setup, Esso buys electricity from PSE&G at regular rates, exchanges fuel oil for steam. Also, Esso supplies the Linden station with treated water (which is further treated by PSE&G) in the amount equivalent to the steam condensate lost in the steam transfer.

**Flexibility:** For Esso, the arrangement eliminates boiler maintenance costs and downtime problems. And it means greater flexibility because Bayway doesn't have to worry about adding generators, boilers or steam lines to increase the capacity of its power system. Besides these gains, there is probably a psychological advantage: the company has the dollars-and-cents figures on hand when it's buying power, so there is an incentive to buy no more than necessary, says one of the refinery's staff.

Small plants could hardly justify such an arrangement. But the pattern for purchase of electricity and steam by large plants seems well established. And Esso is setting a high-voltage pace that may not be matched by most other chemical process industry members for some time to come.

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Varian's Emery Rogers (center) instructs East Indian scientist in new NMR spectrometer operation.

# New Analyzer Reveals the 'Unseeable'

**Next month, at the International Science Exhibit at the Brussels world fair, the public will get its first look at an instrument that's intended to show chemical structures never before observable.**

They'll be viewing a 60-megacycle high-resolution nuclear magnetic resonance (NMR) spectrometer developed by Varian Associates (Palo Alto, Calif.). It's the most powerful version, to date, of a type of spectroscopic instrument discovered in 1946 but only recently finding widespread use by researchers in the chemical process industries.

NMR, which supplements rather than replaces X-ray, infrared or ultraviolet spectroscopy, is at about the same stage of development as these other analytical tools were a decade or more ago.

In NMR studies, compounds are identified by measuring the magnetism and spin of their atomic nuclei. It's done this way: The substance under investigation is placed between the poles of a magnet, is then subjected to low-power radio waves. Passing through the sample, the waves are altered. These changes are easily noted on an oscilloscope or recorder, and the resulting line pattern provides clues to the composition of the substance under study. (The same principle is used to study electron magnetic resonance.)

Emery Rogers *(see photo),* who is field engineering

manager of Varian's instrument division, calls the new instrument a "technological triumph." It greatly increases viewing power over previously available 40-mc. instruments (which Varian has discontinued). Another plus: its cost is somewhat less than the $30,000-35,000 price of its 40-mc. predecessors.

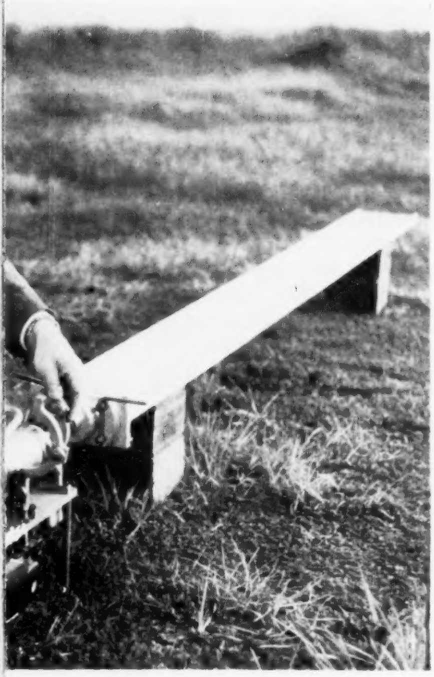
Varian, incidentally, has little competition, for the time being, in this field of instrumentation. Giant electronics firms such as General Electric and Westinghouse are not in the field. Two U.S. competitors, Schlumberger Well Surveying Corp. (Ridgefield, Conn.) and Nuclear Magnetic Corp. (a subsidiary of Perkin-Elmer), do not

## Pollution Trackers

**Research toward the design** of more-effective air pollution and smog control equipment may be simplified and speeded by use of Stanford Research Institute's two new particle-size analyzers. SRI's Charles Lapple (*above*) sets up the analyzers; they may be used separately or together. They are designed to determine "effective size" of particle clusters in the atmosphere in terms of their rate of settling. The continuous gravity chamber (*right*),

yet offer a comparable instrument. Schlumberger, however, now makes a simplified, high-precision NMR analyzer (called Model 104) that is suitable for use by technicians in making routine moisture determinations, etc. European competition is believed to be lagging Varian by two or three years.

**Plenty of Users:** But there's no dearth of researchers applying the techniques of NMR. Du Pont, American Viscose, Olin Mathieson, Monsanto, and many other CPI firms own NMR equipment and are doing research. Independent, government, academic and institutional researchers are also active in the NMR



## Take a New Tack

can collect particle sizes 2 to 50 microns in diameter, show the proportion of various sizes of particles. The centrifugal analyzer (*left*) will produce analyses for particles down to 0.1 micron.

This data may lead to better insight into the basic mechanism in many fine-particle applications, may be applied to improved design of dust control equipment, to more effective use of pesticides.

field. Now, Franklin Institute (Philadelphia) is contemplating setting up an NMR research lab for government and industrial contract research.

In general, NMR is particularly useful for determining moisture content, for nondestructive analysis of compounds (e.g., steroids) in cases where alternate methods are inadequate, for measurement of flow rates (without inserting a meter into the stream), and in basic research, such as studies of the cross-linking of polymers.

Franklin Institute's Nicholas Fuschillo and other researchers have used NMR to elucidate the structure of polyethylene. The technique has also been used to advantage in determining the structure of phosphates and phosphorus-containing compounds in detergents. And it's expected to be particularly helpful in research on alkaloids and steroids, possibly helping to turn up new drugs. One possibility: new light on disease, resulting from NMR studies of living organisms.

So far, NMR researchers have merely sketched the outlines for future research in their field. (At a recent conference on NMR, sponsored by the New York Academy of Sciences, only 14 papers were given.) In years to come, NMR is expected to become a much more familiar—and useful—research tool.

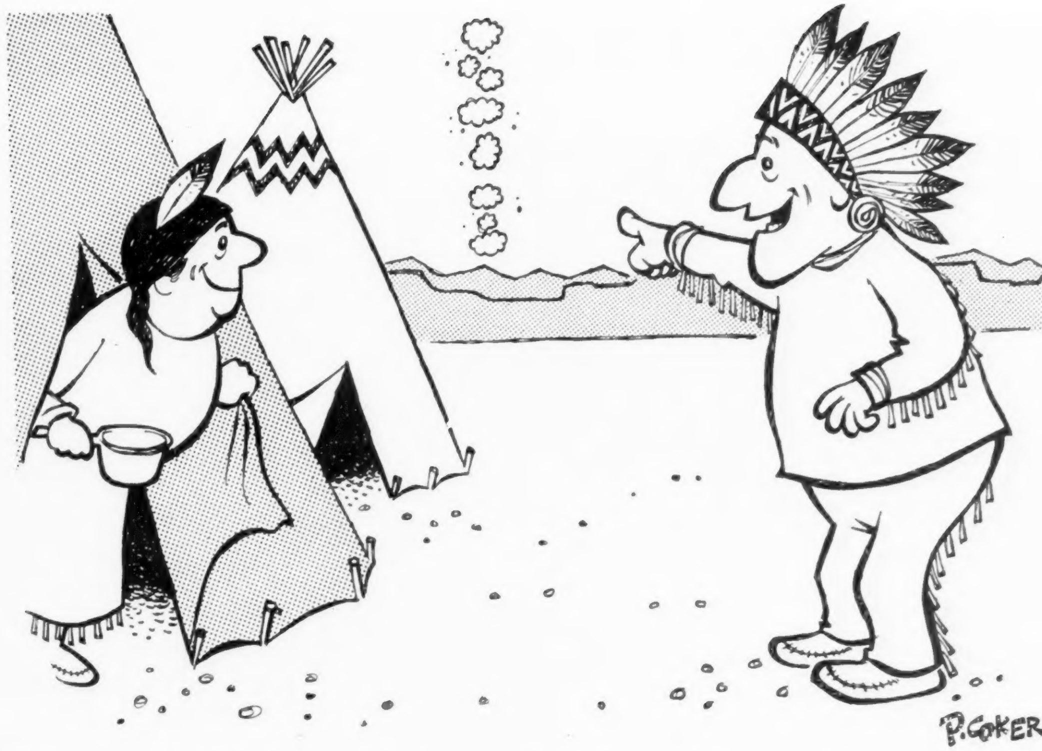
## EXPANSION

• Parke, Davis & Co. (Detroit) is now constructing a $10-million medical research lab in Ann Arbor, Mich. To be completed in 1960, the lab is part of P, D's $40-million, 5-year expansion program, will house 400 researchers.

• Hooker Electrochemical Co. (Niagara Falls, N.Y.) has turned the spade on its new $3.5-million research center at Grand Island, N.Y. When completed, the center will employ 200 technical and administrative personnel.

• Wesson Metal Corp. (Louisville) plans a $500,000 metals research lab, will enter the field of new-metals development for electronic and nuclear devices for missiles.

• Standard Oil of New Jersey has created a new affiliate, the Jersey Production Research Co., will take over existing facilities of the Carter Research Laboratories in Tulsa, Okla. Jersey Production assumes the work that Carter previously did on a contract basis.

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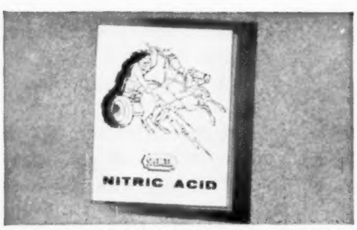

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**Trainees 'wear two hats' as they turn from shorthand classes to a stint in the chemical laboratory.**

# Office Aides Try Technical Training

**In Pittsburgh last week, 70 secretarial students were mulling over what they learned of chemical processing and engineering in a visit to the U.S. Bureau of Mines Laboratory at nearby Bruceton. The trip was part of a training course specifically designed to technologically orient secretaries and office assistants.**

Considering the hue and cry about shortages of engineers and scientists, Pittsburgh's Business Training College —which does the teaching—figures its graduates can go a long way toward relieving busy technical people of routine, time-consuming administrative work.

The 70 trainees who will graduate next June—men as well as women take the course—will be BTC's first large class. Already, demand appears to be swamping supply. Inquiries have been received about the course from all over the world. Last year's pilot class of three students is already at work.

**Typewriter to Test Tube:** The two-year course—just recently awarded Junior College accreditation—offers students the usual run of secretarial studies: shorthand, typing, spelling, dictation, and the like. In addition, they're trained in pre-engineering physics, including laboratory work, technical mathematics, slide-rule instruction, inorganic and organic chemistry, including laboratory work, blueprint reading and a survey course on current engineering literature. A thesis is required for graduation.

Students, mostly just out of high school, qualify for entrance through stiff aptitude tests and personal interviews. The school says that graduates can qualify for work in civil, mechanical, electrical, chemical, metallurgical, aeronautical and industrial engineering.

Of particular importance, BTC feels, has been its development of a specialized scientific shorthand method, supplementing regular shorthand, that enables stenographers to take difficult technical dictation rapidly. The school also gives students background in statistical typing, engineering terminology, and the transcription of engineering data.

**More than Secretary:** BTC feels it's a misnomer to call graduates merely secretaries or stenographers. BTC says that its students are qualified for further work at regular colleges or for immediate entrance into business and industry as valuable assistants to technical personnel. The school says its graduates may be employed also as engineering aides, drafting assistants and technical editorial assistants. Also, BTC feels that its training would be valuable for many Defense Dept. office personnel.

Though 70 students will graduate this year—and are expected to be snapped up quickly—interest in the graduates indicates that by term's start next fall the course will have to be greatly expanded. And, says BTC, chemical process firms will likely be in the vanguard of those seeking personnel.

Cyanamid's Moore: More sales in Canada, more local 'say-so'.

# Cyanamid Goes 'Canadian'

**Last week Cyanamid of Canada Ltd., newly renamed wholly owned subsidiary of American Cyanamid, was busy implementing changes designed to bring about its "Canadianization."**

In addition to a new name (former name: North American Cyanamid); a new president, Canadian educated L. P. Moore (*CW Business Newsletter, Feb. 22*); and new headquarters (to be established later in Montreal), the company plans to place more Canadians on the board of directors, redirect the emphasis in its marketing program. Although there's talk of possibility of a future public offering of its stock to Canadian investors, Cyanamid officials emphasize there's no present plan to do so.

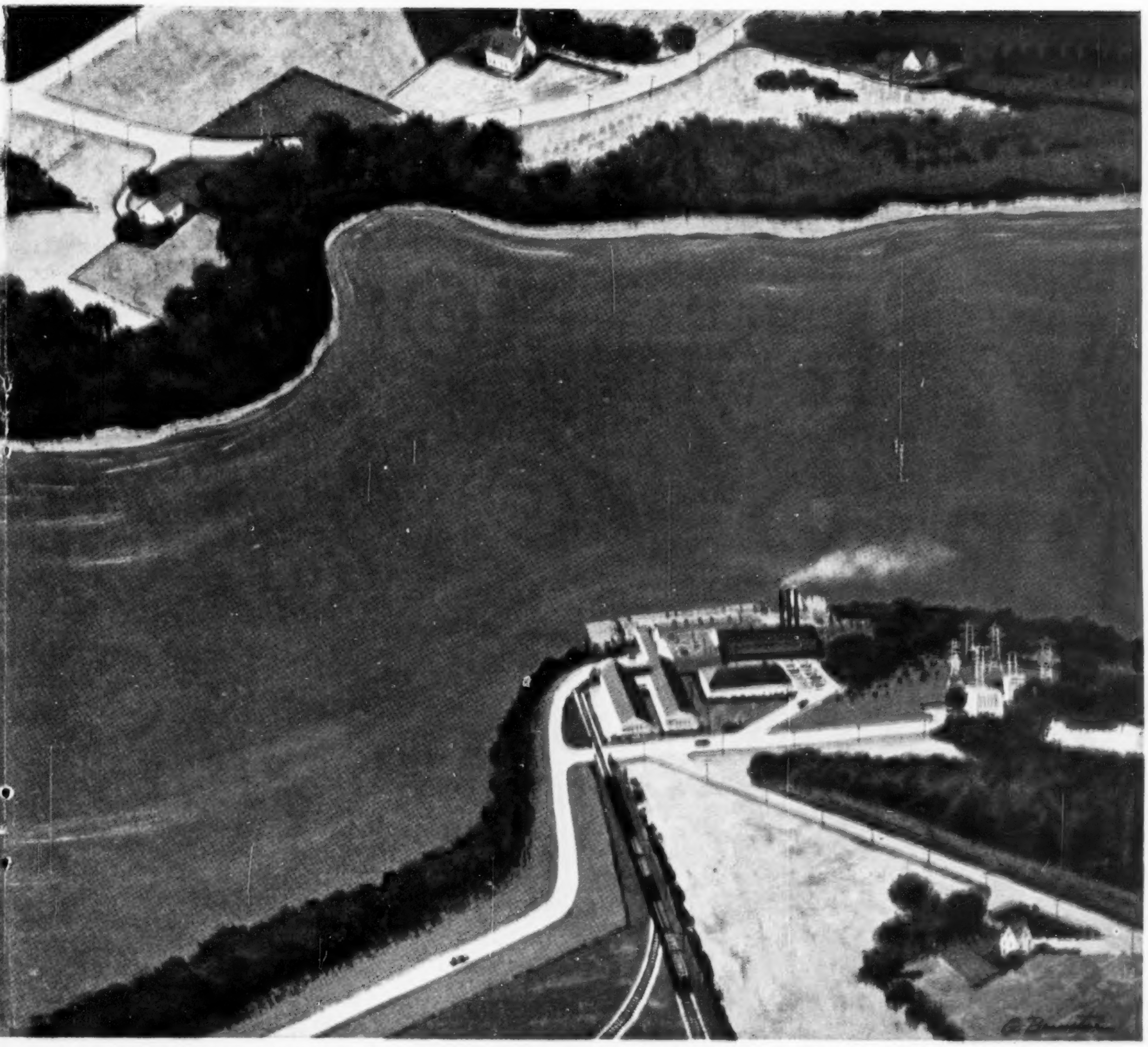
**Administrative Reorganization:** To carry out the sweeping changes planned for the concern, Moore is reorganizing every department down through its sales unit. Goal: creating a largely autonomous, integrated Canadian operation with increased activity in Canada and Canadian supervision.

Redirected emphasis in the marketing program will take the form of more production for Canadian markets. Some 55% of the company's production now goes to foreign markets. Fertilizer components, biggest single product group by volume, have been produced largely for export.

Behind Cyanamid's moves to "Canadianize" its subsidiary are these significant factors:

(1) With the formation last month of a foreign division, Cyanamid International, Cyanamid management decided to concentrate more on foreign markets, less on subsidiary exports to the U.S. (*CW, Jan. 11, p. 23*).

(2) Cyanamid, like most U.S. parents of Canadian subsidiaries, has been under pressure from private and official Canadian sources to permit more direct Canadian participation in key industries (*CW, Feb. 2, '57, p. 32*). Canada's Gordon Commission has recommended that foreign parent concerns be encouraged to take "voluntary" steps to give Canadians a greater voice in their economic future.



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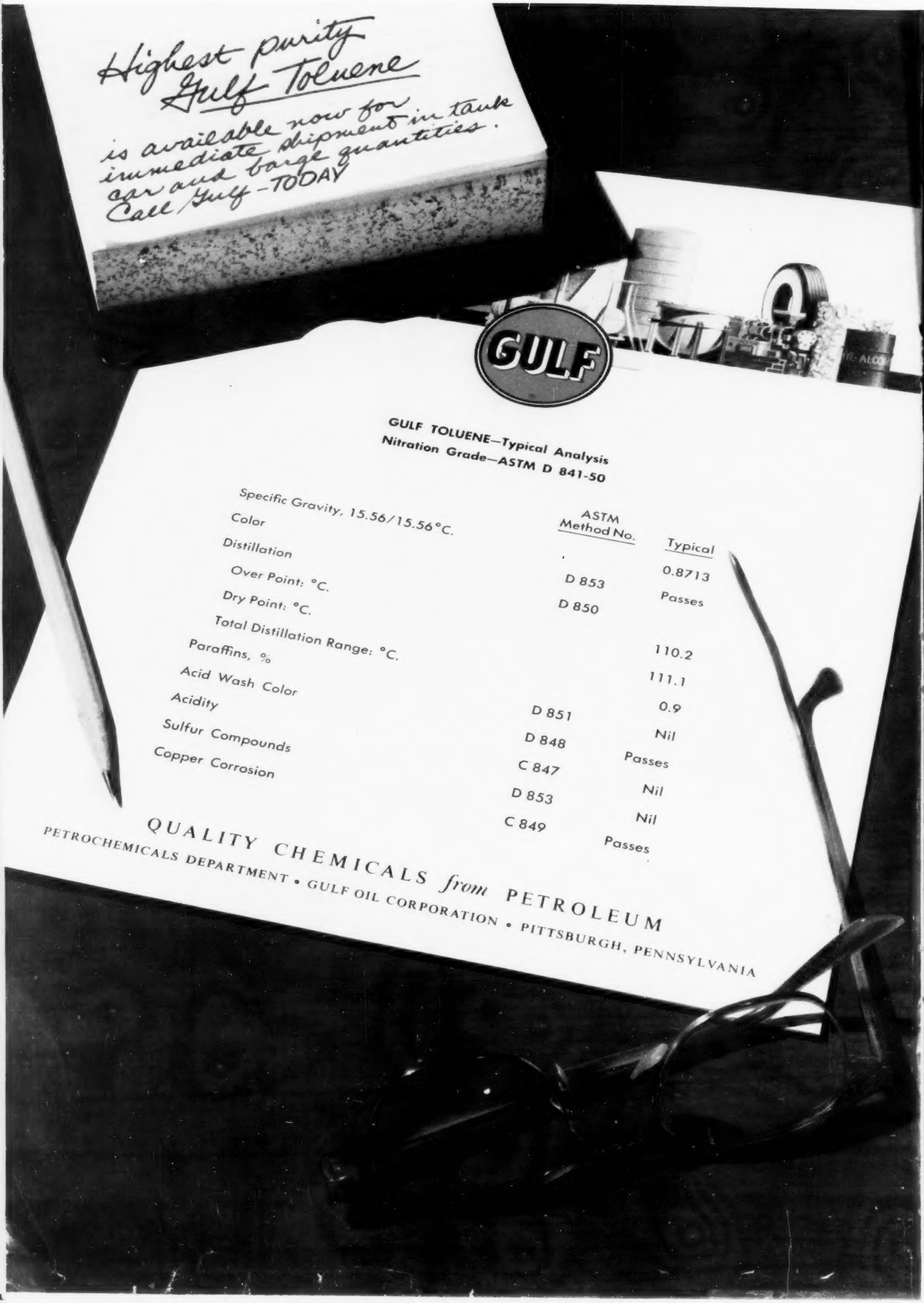
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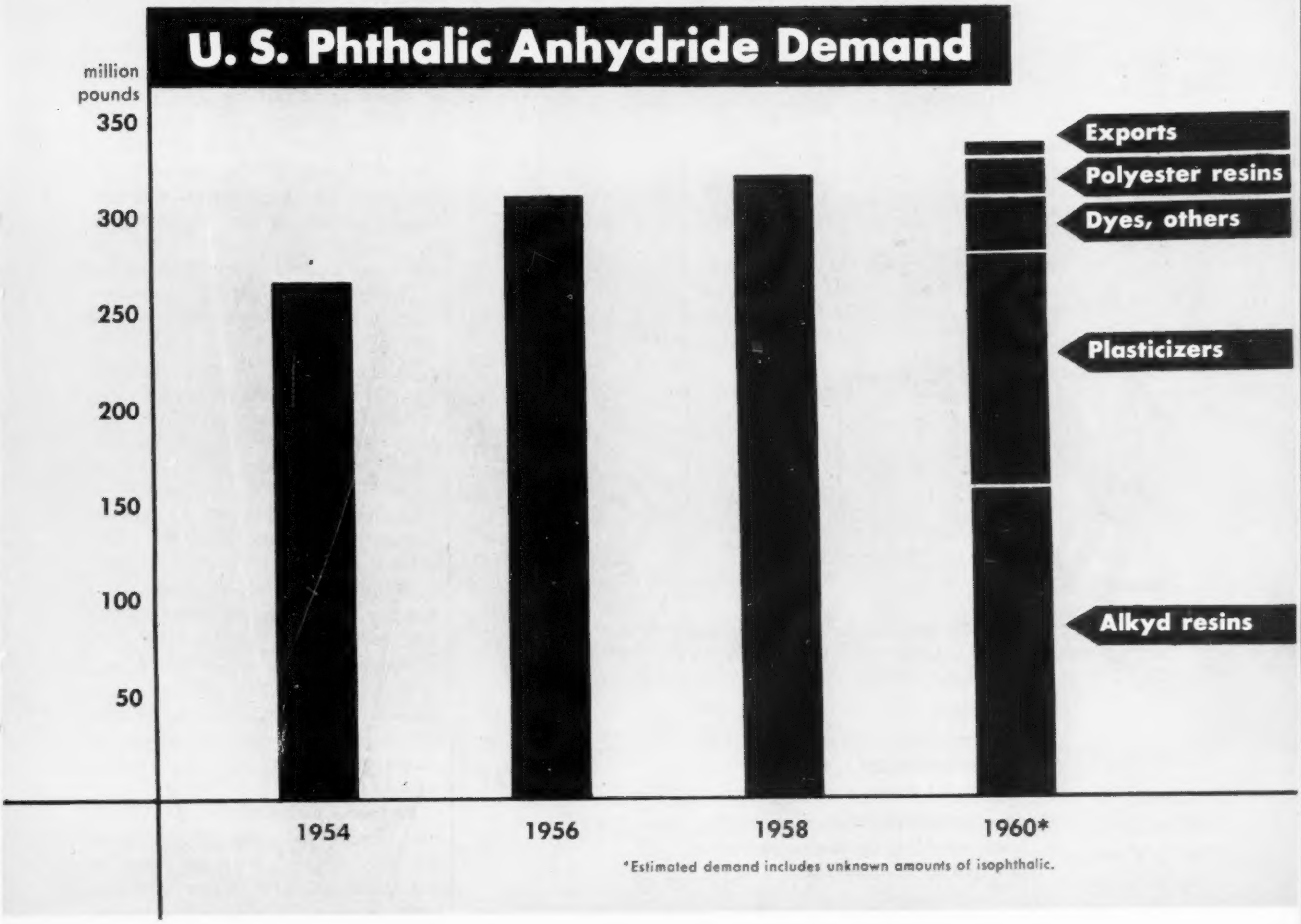


# Setting the Stage for Phthalic Price Cut

**Two questions are being bruited about the industry this week: "Will there soon be a price cut on phthalic anhydride? Would a lower official price bolster a sagging market?"**

"A price cut is certainly not going to help us sell any more of our product," emphatically stated one major producer. And, he continued, "Increased costs of raw materials, sky-rocketing labor and production costs, completely scuttles any question of lowering official price."

On the other hand, a representative of another large manufacturer of phthalic isn't as firm, points out that the aim of a price cut is not so much that of selling more phthalic anhydride but rather one of curbing competition from the comparative newcomer, isophthalic acid. Thus any official price cutting would be for the purpose of hanging on to present customers of anhydride.

**Excess Capacity:** In spite of these pros and cons of price cutting, there's no doubt that right now, and well past 1960, domestic capacity for producing phthalic is, and will be, well ahead of domestic demand.

Nonetheless, some notes of confidence are heard in the industry. Witco Chemical will build a 20-million-lbs./year phthalic anhydride plant (due in mid-'59); the company expects to dispose of all output without difficulty.

Besides the new Witco unit, Amoco Chemicals has started construction of a mixed isomer plant at Joliet, Ill., with an operating capacity of some 60 million

lbs./year. It's also due onstream by the end of '59.

Adding up the score, domestic phthalic anhydride capacity by the end of '59 will hit some 490 million lbs./year. When isophthalic and other isomers are added, total U.S. capacity will nudge some 600 million lbs./year.

Considering that the most optimistic forecast for total phthalic anhydride demand by '60, is some 340 million lbs. (less than 60% of total capacity for that year), it's apparent why producers are concerned. Furthermore, it's moot whether present markets for phthalic, especially the major ones, will continue to hold up as industry introduces technological changes and new products.

**Alkyd Resins; Growth Stubbed:** In '60, an estimated 160 million lbs. of all forms of phthalic anhydride—47% of total demand—will be consumed in the production of phthalic alkyd resins. Back in '54, the alkyd resins need was some 58% (about 140 million lbs.) of the total U.S. anhydride supply.

While output of phthalic alkyd resins will likely grow a little (to some 450 million lbs. estimated for '60, compared with 382 million lbs. in '54), it hasn't surged along as many producers had hoped it would. Reason, of course, has been the advent of water-based paints into the surface coating field.

**Surface Coating Shake-up:** At one time, rosins and natural resins were the only resinous materials used in the paint industry. When synthetic resins made their debut, alkyd resins, especially phthalics, vaulted into popularity. Today, about 46% of surface coatings are based on phthalic alkyds.

Although the alkyd resins are firmly entrenched in the surface coating market, this market is a slow-growing one. Total paint sales last year hovered at some $1.6 billion, a gain over '55's $1.37-billion sale but not too significant in terms of gallonage. While sales have shown a slight upward trend, dollar-wise, indications are that total paint gallonage sold has been slipping. Improved paint technology makes it possible to use less paint for covering a particular surface than was needed several years ago.

Big blow to the alkyd resin industry, and in turn, to phthalic anhydride producers, however, was the introduction and the growing popularity of water-

# Can you name all the stearate applications in this picture?

ANSWERS TO PICTURE PUZZLE

*Witco Stearates are improving products, smoothing processes, cutting costs in a multitude of applications throughout industry. A few of the applications are shown in this picture.* ***Can you name them?***

1 **Rubber Toy**—Witco Zinc Stearate is widely used as a highly efficient mold release agent. 2 **Umbrella**—Witco Aluminum Stearate is a highly effective waterproofing agent. 3 **Powder Compact**—Witco Zinc Stearate is used in plastics manufacture to lubricate mold surfaces and minimize breakage and disintegration of the finished products. 4 **Girl's hair**—Witco Sodium Stearate finds wide application in waveset formulations, shampoos, stick-type colognes, etc. 5 **Spices**—Nontoxic Witco Calcium Stearate improves free-flowing properties of food flavorings, etc.... gives added sales appeal. 6 **Magazine**—Witco Calcium Stearate increases water resistance, improves flow properties, imparts desired flexibility in paper coatings. 7 **Raincoats**—Witco Stearates are heat and light stabilizing agents for transparent plastic films, sheeting and extruded compounds. 8 **Net bag**—Witco Aluminum Stearate imparts water-repellent properties to net bags, fishing nets, etc. 9 **Paint**—Witco Zinc Stearate is outstandingly effective as a flatting agent for paints, varnishes and lacquers. It also aids suspension, eliminates undesirable settling and reduces "color floating." 10 **Lipstick**—Witco Calcium Stearate improves texture, appearance and performance of cosmetic sticks, creams, powders, etc.

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**U.S. Phthalic Anhydride Capacity**

Dec. '59, estimated (million pounds)

| | |
|---|---|
| **Amoco** | |
| Joliet, Ill. | 60† |
| **American Cyanamid** | |
| Bridgeville, Pa. | 75 |
| **Barrett Division, Allied Chemical** | |
| Philadelphia | 75 |
| Chicago | 35 |
| Ironton, O. | 35 |
| **Koppers** | |
| Kobuta, Pa. | 22 |
| **Monsanto** | |
| Everett, Mass. | 40 |
| St. Louis, Mo. | 75 |
| **National Aniline** | |
| Buffalo, N.Y. | 15 |
| **Oronite** | |
| Richmond, Calif. | 18 |
| Richmond, Calif. | 50* |
| **Pittsburgh Coke & Chemical** | |
| Neville Island, Pa. | 35 |
| **Reichhold Chemicals** | |
| Azuza, Calif. | 10 |
| Detroit | 30 |
| **Sherwin-Williams** | |
| Kensington, Ill. | 7 |
| **Witco Chemical** | |
| Chicago | 20 |

†Mixed isomers.
*Isophthalic anhydride.

thinned paints, based on latexes of butadiene-styrene, polyvinyl acetate or acrylic. Some 35 million gal. of latex paint were sold in '54.

By '60, such sales are expected to increase to about 90 million gal., slicing out much of the alkyds' potential growth field.

How are phthalic producers attempting to meet this challenge? American Cyanamid and Reichhold Chemicals have now perfected alkyd emulsion paints, and each hopes to regain some of the market lost to latex-based water paints. One marketer, though, feels that it's just a matter of time before phthalic alkyd resin output will begin slipping because of still-increasing competition.

**Plasticizers Stronger:** Demand for

phthalic anhydride in the production of plasticizers is second in the line-up of important consumers. Two years hence, some 34% (about 120 million lbs.) of total phthalic available probably will be channeled into this growing outlet, compared with the 30%, or a little more than 73 million lbs., consumed in '54. Surging growth of polyvinyl chloride resin (*CW, Nov. 16, '57, p. 71*) should assure continuing phthalic plasticizer demand.

Polyvinyl chloride resins output for '60 is estimated at some 800 million lbs. (vs. '54's 397 million); production of all forms of phthalic plasticizers should hit some 275 million lbs. in '60, compared with 171 million lbs. in '54.

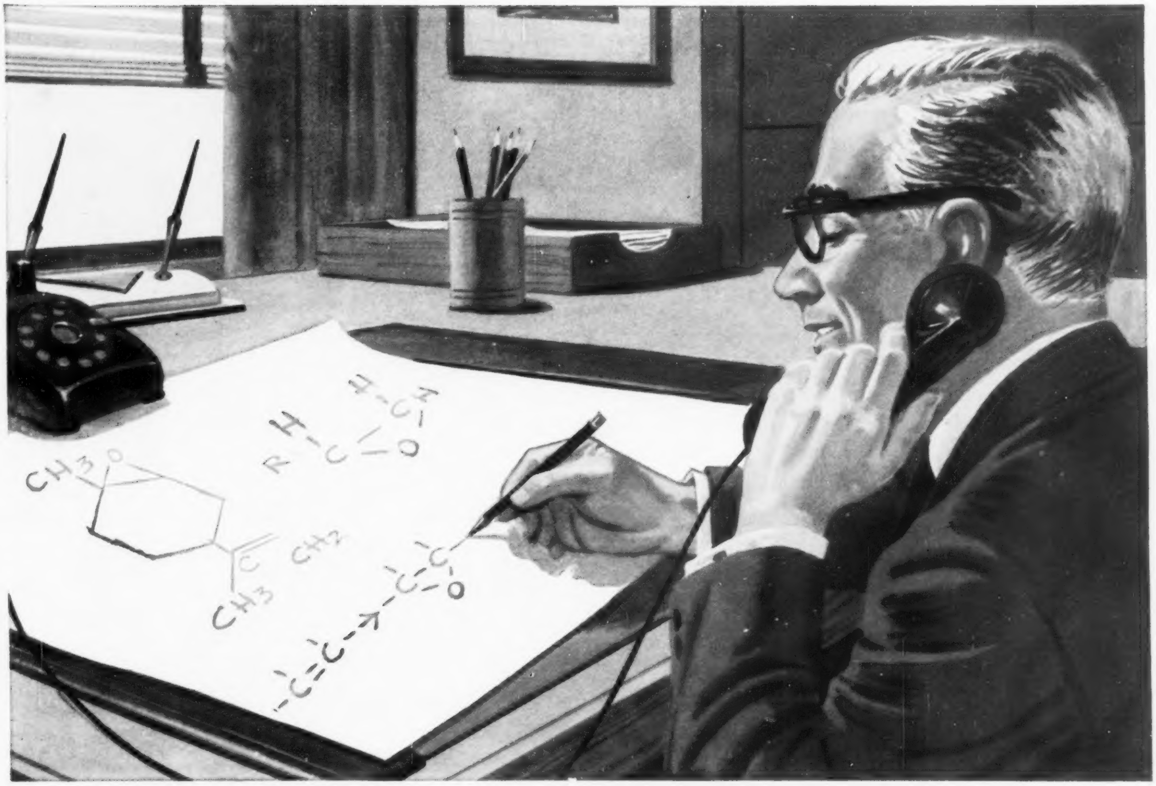
Third important outlet for phthalic anhydride is the preparation of various classes of dyes (e.g., anthraquinone, xanthene, phthalocynine), and intermediates. This category covers a vast area, and it's hard to pinpoint phthalic requirements here.

However, trade consensus is that some 30 million lbs. of phthalic anhydride will be channeled at the end of the decade into the production of these dyes, as well as other outlets, such as pharmaceuticals, metallic salts.

**Polyester Resins Climb:** A small but rapidly growing demand for phthalic anhydride has been for production of polyester resins. Approximately 20 million lbs. of various phthalic anhydrides will be consumed in this outlet within a couple of years. In '54, less than 10 million lbs. of the anhydride were used here.

**Future Exports Down:** In spite of the brisk export growth that phthalic anhydride producers have been experiencing—some 22 million lbs. were shipped to foreign users last year, compared with 11 million lbs. in '54—consensus is that this market will soon be whittled to less than 5 million lbs. Reason: foreign producers have an adequate supply of naphthalene, are now producing increasing amounts of phthalic for domestic needs and for exports. U.S. anhydride sellers may well have to write off this outlet by the end of the decade.

It's apparent, in reviewing the phthalic market, that the immediate demand outlook can best be described as "poor." However, it's also fairly certain that official phthalic price will remain pegged—for the time being at least—secured, as it is, by the strong prop of rising manufacturing costs.



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**Synthetic dyes for food: As FDA re-examines the safety of these and natural colors . . .**

# Food Colorant Suppliers Brace for Trouble

**This coming Monday, March 10, the U.S. Dept. of Health, Education & Welfare's Food & Drug Administration will hold a public hearing in Washington, D.C., that's vital to makers of food colorants. The hearing is to help FDA determine if certain synthetically produced colors for use in foods should be tested and certified as harmless by FDA before being marketed.**

Most immediately concerned will be Hoffmann-LaRoche Inc., which is trying to prevent the listing of its artificial carotene as a coal-tar color. Opposing it is FDA, which claims that according to the Food, Drug and Cosmetic Act, the colorant is a coal-tar color.

The nub of the discussion: the phrase in the Food, Drug and Cosmetic Act (Section 135.01), which states that "the term 'coal-tar color' means articles that (1) are composed of or contain any substance derived from coal tar, or any substance so related in its chemical structure to a constituent of coal tar as to be capable of derivation from such constituent." Beta-carotene, which can be made from coal tar, can therefore be considered as a coal-tar color if FDA chooses to consider it as such.

What Hoffmann-LaRoche will probably do is to try to show the inconsistency in FDA's ruling that natural carotene is free of government regulation while the synthetic material, the identical thing, chemically, is subject to control. It'll be an attempt to get FDA to look at the material *per se* rather than at its derivation.

**Interested Onlookers:** On the sidelines as interested spectators will be the certified color manufacturers who have had to live with certification of their products for over 50 years. They've sadly watched while suppliers of natural colors (which are not subject to FDA control) have grabbed off a lot of the oleo and butter coloring business. And taking over a large chunk of it has been Hoffmann-LaRoche, which has been heavily touting its synthetic carotene as a "non-coal-tar color" and "nature's yellow." Thus it's obvious why Hoffmann-LaRoche disdains the appellation "coal tar" for its product.

In trying to persuade FDA that words don't always mean what they appear to, Hoffmann-LaRoche can get some pointers on semantics from these coal-tar food color makers. The latter group has been trying for two years to show FDA exactly what the single word "harmless" means. It's because of FDA's literal interpretation of that word that the certified food color people saw three primary colors ruled out for food use (delisted); the whole coal-tar food color business was threatened with extinction.

What makes coal-tar food color manufacturers and marketers unhappy is this: the test data on which FDA based its recent decision with delist colors is almost identical to the data used by Dr. Bernhard C. Hesse in the early 1900s and Dr. Herbert O. Calvery in the late '30s to attest to the safety of these same coal-tar dyes.

The food color people have repeatedly—but futilely—shown that if a person subsisted on a diet consisting of nothing but foods colored with coal-tar dyes he would still take far under the level of consumption considered dangerous. But that wasn't enough for FDA.

To counter FDA's stand, the food color people have tried to get the agency to set quantitative levels for food colors, but they've been generally unsuccessful at this. And FDA is fighting the few exceptions.

If FDA is reluctant to assume the authority to set quantitative limits on synthetic food colors, there's a chance it may get that authority—Rep. Thomas B. Curtis (R., Mo.) introduced a bill in July '57 that may become law. It would clarify the act's definition of color and

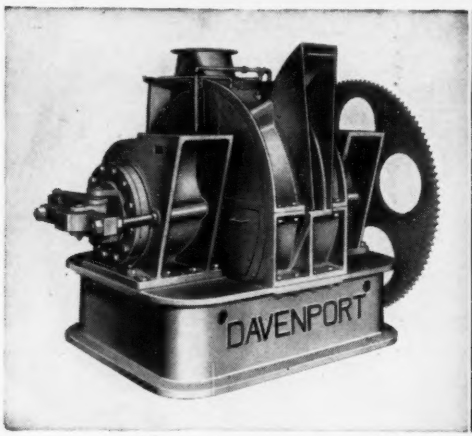
bring natural as well as synthetic food colors under FDA certification requirements.

**Who's Involved:** All the fuss over listings, delistings, tolerances, word definition involve a relatively small industry. To put the whole fracas in perspective, *CW* went to all manufacturers of certified food colors and collected background. Understanding the problem should enable a person to see clearly the issues involved in upcoming Congressional wrangling between food color makers and lawmakers.

**What They Are:** Certified food colors (FD&C colors) are the most important (90% of the certified color business) of three main types of colors that have to be certified by the FDA before they can be marketed. There are only 15 Primary FD&C colors. The other type of certified colors are: D(rug) and C(osmetic) colors; those that can be used in drugs and cosmetics but not in food; and External D & C colors, those certified for use in externally applied drugs and cosmetics but not in food or in any product used internally or on the lip or on any mucous membrane.

**Who Makes Them:** There are only seven U.S. manufacturers of certified food colors at present. Biggest in the field (and oldest) are Allied's National Aniline Division and H. Kohnstamm—both of New York. Between them, they probably have about half the total FD&C business. Next, and sharing business about equally, are Warner Jenkinson (St. Louis) and Stange (Chicago). Then comes Sterwin Chemical Division of Sterling Drug (New York), Bates Chemical (Lansdowne, Pa.) and Dykem Co., a branch of Dyestuff and Chemicals Inc. (St. Louis). American Cyanamid, as does Dykem, only manufactures oil-soluble colors.

These manufacturers share a national market for certified food colors that runs between 1.5 and 2 million lbs. of primary colors annually. Production last year was 1,623,282 lbs.; at $4 to $5/lb., with an annual value somewhere between $6.5 to $8 million annually, that 1.6 million lbs./year of food color seems quite small in the face of a national expenditure of $75 billion annually for food. Food colors go a long way, however; about 300 ppm. is the highest concentration at






which they are used. In round figures, the total FD&C colors turned out in the U.S. each year is enough to impart color to about 100 billion lbs. of finished product. More specifically about ¼ oz. of the FD&C colors will color 100 lbs. of candy, 1 lb. will color some 50,000 bottles of soft drink.

**Jobbers, Too:** In addition to the basic manufacturers selling FD&C colors, there are about 200 jobbers in the field. Some prominent jobbers are Dodge & Olcott (New York); Florasynth (New York); Virginia Dare (Brooklyn); Neumann-Buslee & Wolfe (Chicago); and W. J. Bush (Cos Cob, Conn.).

These distributors work on a 10% markup; they have to split up less than half the total market for FD&C colors—much is sold direct by the manufacturer. Most popular package that the manufacturers sell is the 25-lb. tin; for the jobber, the 1-and 5-lb. packages are most popular.

**Favorite Colors:** The most often used FD&C colors are reds, then yellows. Biggest seller is Red No. 2, which accounted for 452,783 lbs. of the 1,623,282 lbs. of colors last year. Second was Yellow No. 6, which accounted for 388,656 lbs., and then Yellow No. 5, which accounted for 346,203 lbs. No company makes all the 15 primary colors—National Aniline makes the most: 11. The practice is to fill out the list with another manufacturer's material.

FD&C colors range in price from a low of about \$4/lb. (for Yellow No. 5, Yellow No. 6 and Red No. 2) to a high of about \$36/lb. (for Green No. 3.) In the last five years, prices have remained pretty steady. The last price change came about two years ago, when Yellows No. 3 and 4 went up due to a shift in price of intermediates.

Biggest users for certified food colors are (in approximate order) soft drinks, confectionery products, desserts (gelatins, puddings, sherberts, and ice cream) drugs, bakery goods, butter and oleo and sausage casings. There's little change in this end-use pattern from year to year.

What gains there are can usually be attributed more to growth in population than to new uses for food colors. Some of the newer uses reported for the FD&C colors are as colorants for breakfast cereals (General Mills'

Kix) for biscuit-type dog foods and in children's water colors.

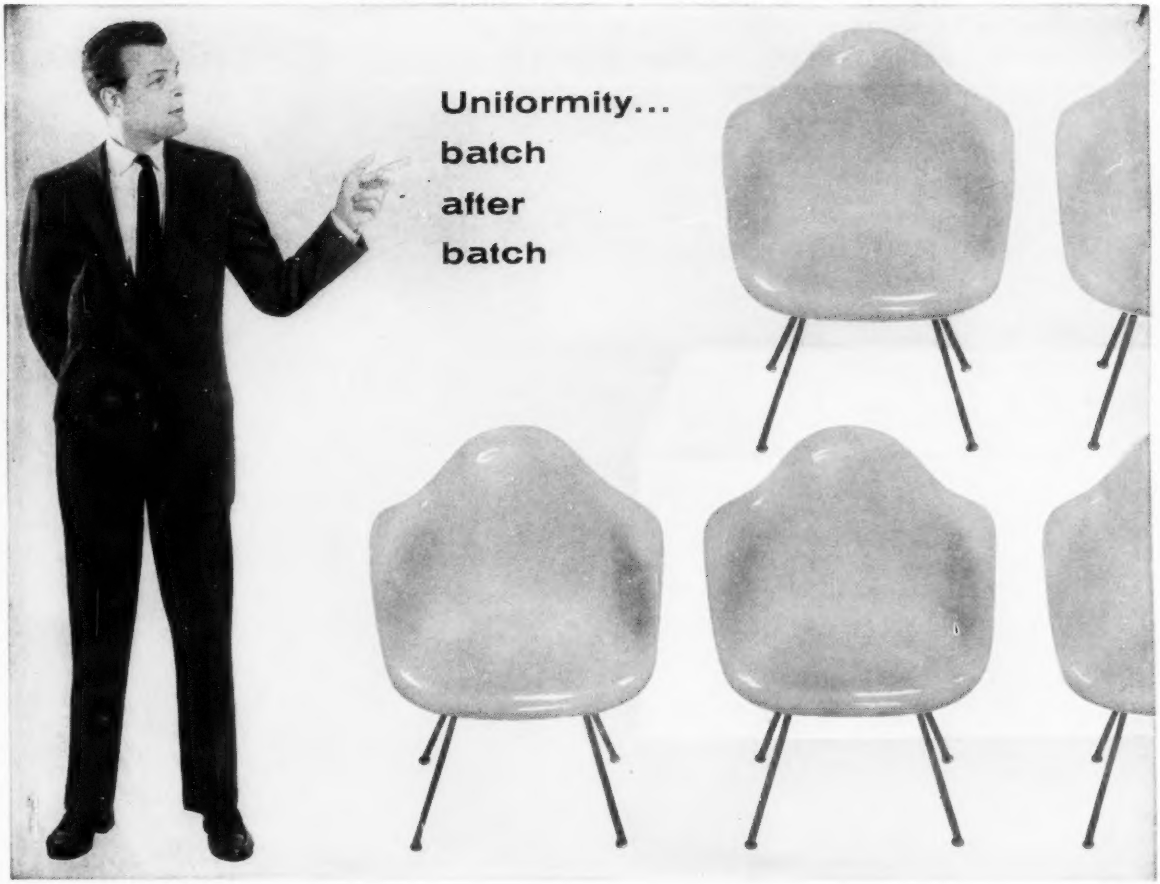
Coming up with a new FD&C primary is an event that doesn't happen very often. The last color to go in the list (and they're coming off faster now than they're going on) was FD&C Violet No. 1, an upgraded D&C color. Next may be a dye called Orange B that Stange hopes to have proved out by the coming May. If it passes FDA scrutiny, it may be a good item for coloring casing on franks, bologna, etc. Calco, Division of American Cyanamid, is reported to be making some progress in a search for a product to replace the delisted Red No. 32, the dye used in coloring orange skins. After March 1, '59, the FDA withdraws its statutory authority to approve use of this dye for coloring oranges under the listing external D&C Red No. 14.

There isn't much in the way of export business for FD&C colors (some rate it at about 5% of total sales) and still less in the way of competition from foreign suppliers. One factor building up the export business is the requirement that any food coming into the U.S. that's artificially colored must have colors certified by the FDA. These colors don't have to be U.S.-made colors, but as a matter of fact most of them are. Biggest markets for exported FD&C colors are in Canada, South America and Europe, in that order.

Thus, in both U.S. and foreign markets, domestic approval seems to be a bane to color manufacturers. It's no wonder they'll be down in Washington in force next week.

## Purex Goes Bats

**In its first departure** from the household products field, Purex Corp. Ltd. (South Gate, Calif.) has gone into distribution of bat guano through its grocery store outlets. Through an agreement with New Pacific Coal & Oils Ltd., collectors of the product, the highly concentrated nitrogen plant food will share the grocery shelf with other Purex products (Beads-O-Bleach, Dutch Cleanser, Sweetheart Soap, etc.). Retail shelf price will be around 69¢ for a pound package, $1.89 for the 3-lb. size. The product will be introduced in southern California this month. Plans are to distribute nationally.

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# Technology

## Newsletter

CHEMICAL WEEK
March 8, 1958

**A new insulation material, Min-K,** is being introduced by Johns-Manville. The new material, aimed at aircraft and missile application, is claimed to have a thermal conductivity less than half that of conventional insulations. As J-M researchers see it, this saving on insulating space could enable a rocket or missile to increase its fuel capacity by as much as 20%.

The firm is not saying anything about the nature of the material. It describes it merely as a bonded structure reinforced with fibers and containing appreciable quantities of small particles. It also incorporates opacifying media to keep down the transmission of radiant energy.

•

**A new form of nickel is being unveiled this week** in New York by Metachemical Processes Ltd. (Crawley, England). Tagged Micrograin, it's said to be so hard (Brinell 600) that it can't be filed, so flexible it can be bent without cracking, so fine-grained that, as yet, no method of etching it for micrographic inspection has been found.

•

**Additives to the fuel** may cut down the corrosive effects of gases in gas turbine engines. Three researchers from Gulf Research and Development told the third annual Gas Turbine Conference in Washington this week that they were able to reduce corrosion substantially by additives that increased costs only 1 to 11¢/bbl. of oil.

Among the compounds that proved effective were micronized talc, magnesium oxide, potassium permanganate, rare earths, oil-soluble salts of magnesium naphthenate. Even sea water and other materials containing sodium or potassium reduced certain types of corrosion and enhanced the effectiveness of other inhibitors.

•

**The importance of radioisotopes** is heavily underlined in the recent report by the Atomic Energy Commission on "Progress in Peaceful Uses of Atomic Energy." Right now, there are 1,600 organizations authorized to use radioisotopes for industrial purposes. That includes 250 of the 500 largest U.S. corporations. These isotopes have produced savings now estimated to be more than $500 million/year, five times the comparable figure for '53.

•

**A vitamin preparation incorporating D-sorbitol** to enhance absorption was placed on the market by Smith, Kline & French last week. Called Vi-Sorbin, it's a liquid containing vitamins $B_{12}$, $B_6$, iron and folic acid. Normally, oral doses of $B_{12}$ require "intrinsic factor" (certain gastric substances still largely unidentified) to insure assimilation. The use of D-sorbitol eliminates the need for intrinsic factor, says SKF. The new product is an outgrowth of a discovery made three years ago with an experimental vitamin preparation the firm had made, using D-sorbitol as a vehicle. Exceptionally high $B_{12}$ absorption rates resulted.

**Technology**

**Newsletter**

(Continued)

**Papain has been used successfully to promote healing** of surface wounds. Surgeons at Fort Howard Veterans Hospital (Maryland) report that a combination of papain, urea and chlorophyll derivatives produced excellent results in 100 of 106 infected wounds.

A derivative of papaya, papain was one of the first enzymes to be produced for commercial applications. But bromelain—a faster-acting enzyme derived from pineapple (*CW Technology Newsletter, Feb. 16, '57*) —has been taking over parallel functions since the Food & Drug Administration cracked down on foreign imports of substandard papain.

•

**Radioactive strontium for studying fractures and diseases** of the bone? It's the key to a new technique developed by Norman S. MacDonald, of the Atomic Energy project, at the University of California (Los Angeles). His novel method employs strontium-85—reportedly a medically safe relative of the hazardous fallout product, strontium-90.

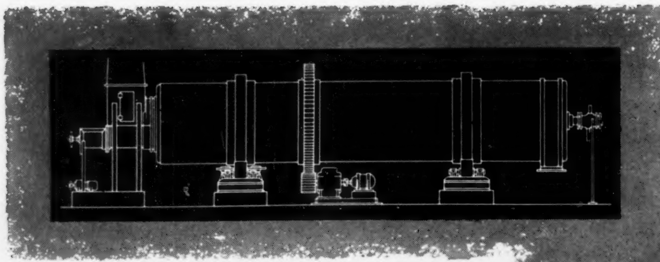
Radioactive strontium-85, which can be produced in a cyclotron, concentrates in the bone when injected into humans. But unlike strontium-90, which emits hazardous beta radiation over a long radioactive lifetime, the lighter isotope is short-lived, decays by emitting gamma rays. And the radiation from small amounts of strontium-85 is not harmful to humans, can be automatically recorded by an external recorder known as an osteogram. The technique has made it possible to follow the healing process in bone fractures, says MacDonald; it is now being researched for the study and diagnosis of bone diseases.

•

**Beta-propiolactone is a promising gaseous sterilizing agent,** according to experiments by C. R. Phillips, chief of the Physical Defense Division of the U. S. Army Chemical Corps. (Fort Detrick, Frederick, Md.) He reports that bactericidal concentrations of beta-propiolactone vapor in air are quite easy to obtain because the material is active at low concentrations. The gas is as effective as formaldehyde vapor, said Phililps, but acts more rapidly and with fewer adverse side effects. However, it's not as effective as ethylene oxide in penetrating porous materials. Bactericidal and virucidal action of all these gaseous agents is believed to depend on their ability to tie up proteins necessary for cell metabolism.

•

**Radioactive waste may simplify getting viscous crude oils** out of the ground, according to George W. Crawford, University of Texas physicist and assistant director of the Texas Petroleum Research Committee. Crawford has begun the study of gamma radiation effects on crude oil, hopes to learn how controlled radiation may be applied to thick, viscous crudes that cannot now be recovered by conventional primary or secondary processes. Gamma bombardment of the heavy crudes by injected radioactive wastes is expected to break molecular bonds, thereby producing lighter molecules and decreasing viscosity. The oil could then be recovered by a secondary process.



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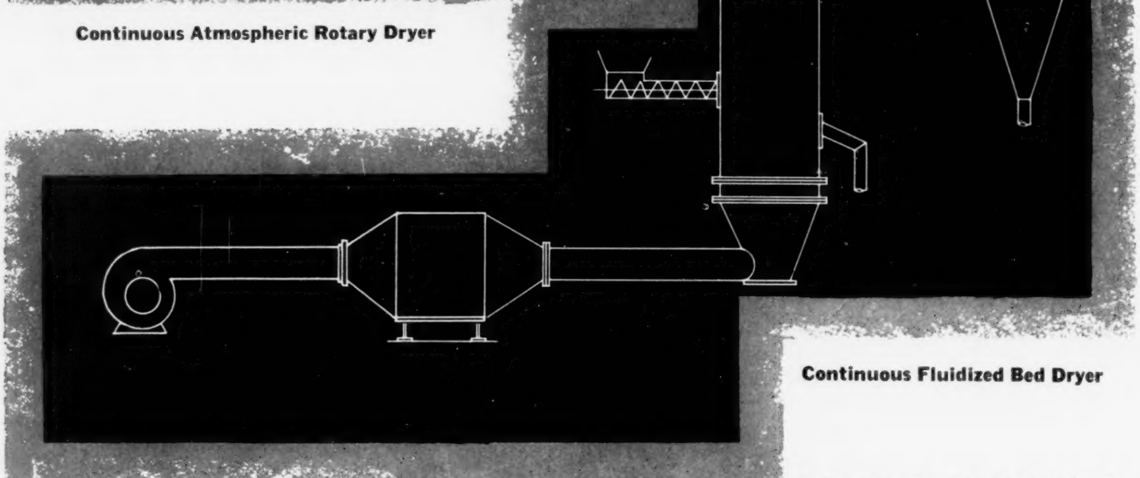
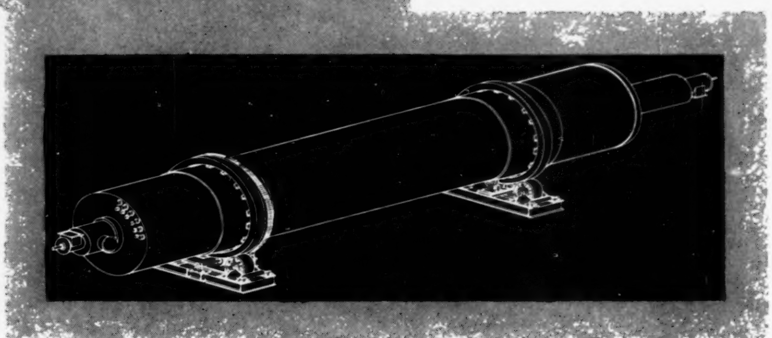


Continuous Fluidized Bed Dryer



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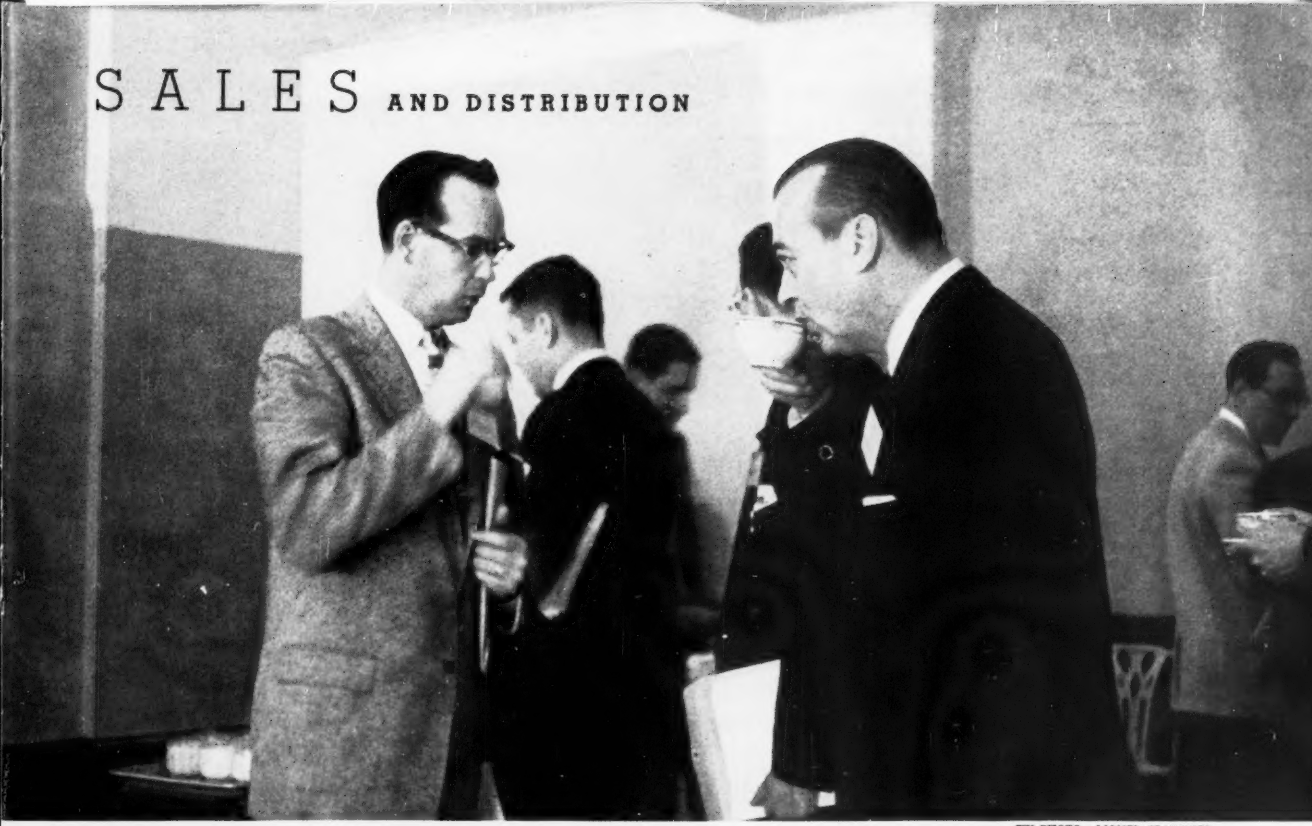


CW PHOTO—LIONEL CRAWFORD

**Over the coffee cup, chemical credit men chart new approach and stronger ties to marketing effort.**

# Chemical Credit Men Chart Sales Aids

**Chemical credit men** are swiftly intensifying cooperation with sales departments. This was the big shift in attitude apparent in the quiet coffee breaks, in the brainstorming sessions and in the free-wheeling floor discussions at last week's fifth annual Chemical Credit Men's Convention in Philadelphia.

A year ago, credit men were most deeply disturbed about the growing slowdown in customer bill payment. It's still a matter of concern—but they've done about as much as they can to speed payment and are now placing major emphasis on how they can help sales.

Setting the general tone of the meeting was Columbia-Southern's Orrin Storholm, keynote speaker. If the credit man can solve two current problems, Storholm sees great opportunity for credit executives to win a place in management. The problems: rising requests for credit extensions; increasing attempts by customers to "play off two competitors against each other" with respect to credit terms.

**Convention report stresses advantages of sales-credit teamwork.**

Suggestions at four rapid-fire brainstorming sessions later in the day showed heavy sales-consciousness. The question posed to the panel: "What can you do to insure growth of your company?" At least half of the suggestions made related to aid for sales. Most frequently mentioned:

- Be more salesminded.
- Improve liaison between credit and marketing functions.
- Develop credit policies with greater flexibility.
- Become familiar with new products and their profit margins.
- Participate in sales meetings and sales training.
- Get the sales department to realize that the credit department is helping sales efforts.
- Take greater risks on products that have high profit margins.

**Brainstorming produced 200 ideas to aid company growth.**

- Provide financial analysis service to customers.
- Define a new credit policy with a strong sales approach.
- Develop marginal accounts.
- Spend more time in the field; survey areas for new customers.
- Explore export sales opportunities.

Though the majority of suggestions had a strong sales slant, an appreciable number reflected cost- and profit-consciousness. Generally, these suggestions called for improved knowledge of the profitability and risk ratio of marginal accounts. And some called for strong efforts to push profitable items and for a close watch on the age of accounts receivables.

**Sales-Credit Liaison:** At an afternoon session, credit men demonstrated that their desire for closer contact with sales was being put into practice. Man after man took the floor to describe the devices he uses to foster sales-credit cooperation. A show of hands revealed that almost all the 125 credit men attending give salesmen credit facts.

One company stresses not only communications between sales and credit managers but also liaison between credit men and product managers. This affords an opportunity for credit men to learn of product sales emphasis, and gives product managers a chance to learn how credit may help develop markets. The same company also alerts new salesmen to credit risks in a given territory.

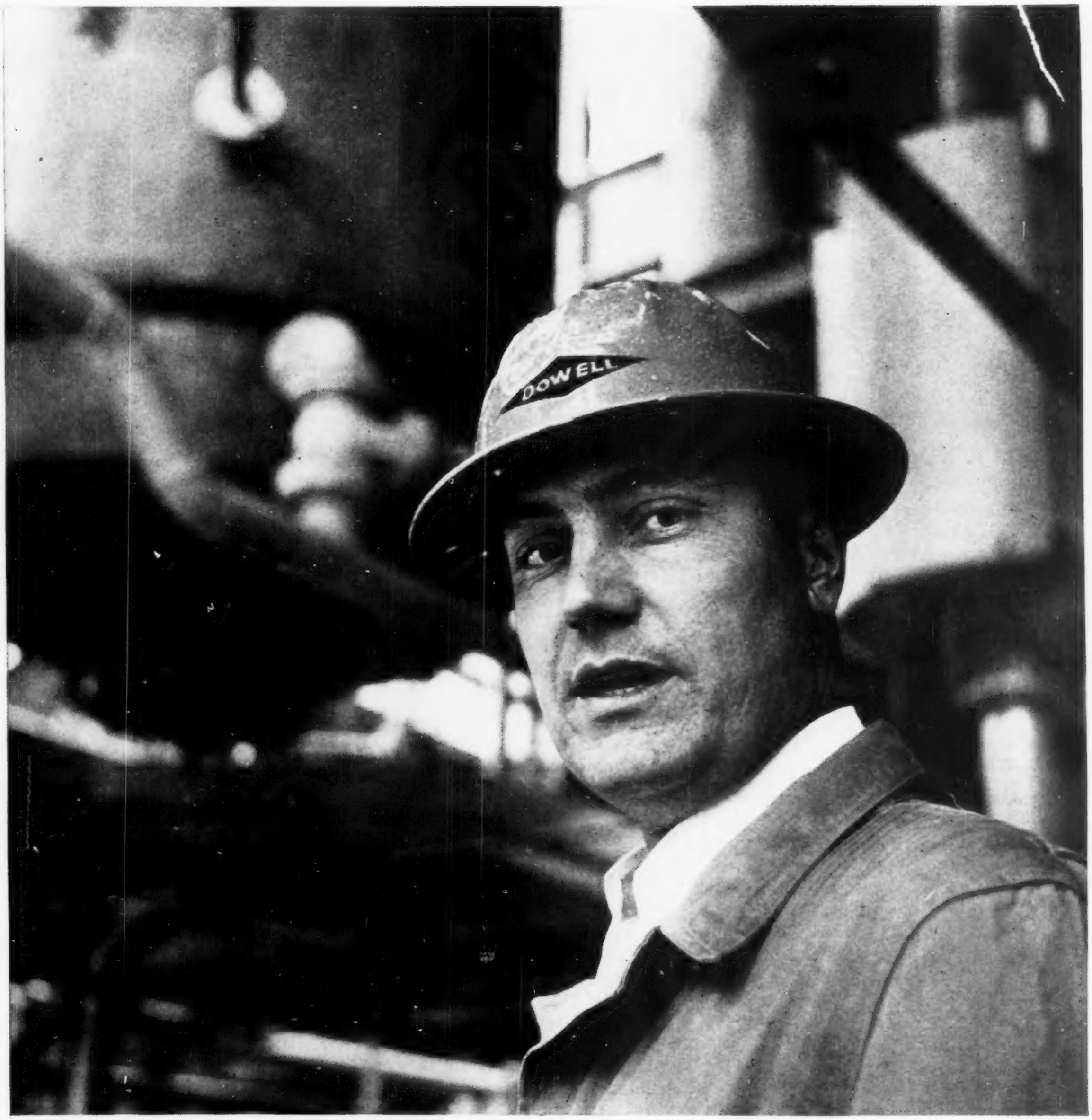
In another firm, a special short program, "Credit Orientation Procedure for Salesmen," is in effect. Its success is limited, however, when there is little cooperation from sales departments.

Goodwill letters to salesmen and customers at Christmas, reported one credit executive, have encouraged salesmen to tell the credit department of events that might affect customers' financial ratings.

Many credit managers now see salesmen's call reports on "marginal accounts." And they reciprocate—they send reports to the credit call salesmen. A few even send memos of phone conversations. Credit bulletins also help keep contact with salesmen.

Of all the methods of improving sales-credit liaison, none perhaps is as effective as credit meetings for salesmen or joint sales-credit men field trips. One Eastern credit manager described his system of periodic visits (once every 6 or 8 months) to sales offices. There, in special meetings, he can discuss territorial credit problems and potential opportunities for new business with the sales team.

The same man also travels with field salesmen to study the relations between the salesman and his contacts. And a Midwestern credit director reported that field trips with salesmen have been so successful that

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the credit department is now requested to help sales, have a man on hand at convention exhibits.

**Credit 'P Rs':** Emphasis on better coordination with sales extended beyond the program of case history panel discussions. The banquet speaker, Sohio's associate director of public relations, Frank Kovac, chose a related theme—credit public relations. Kovac urged development of what he termed three "P Rs."

• Professional rating—the status that credit holds in the eyes of other company departments.

• Public relations—relationship of credit to the entire corporation complex. In particular, said Kovac, credit departments should not duck fights between sales and finance departments; they should be aggressive in helping sales develop new business, issue detailed reports to management on the significance of the then-current credit trends.

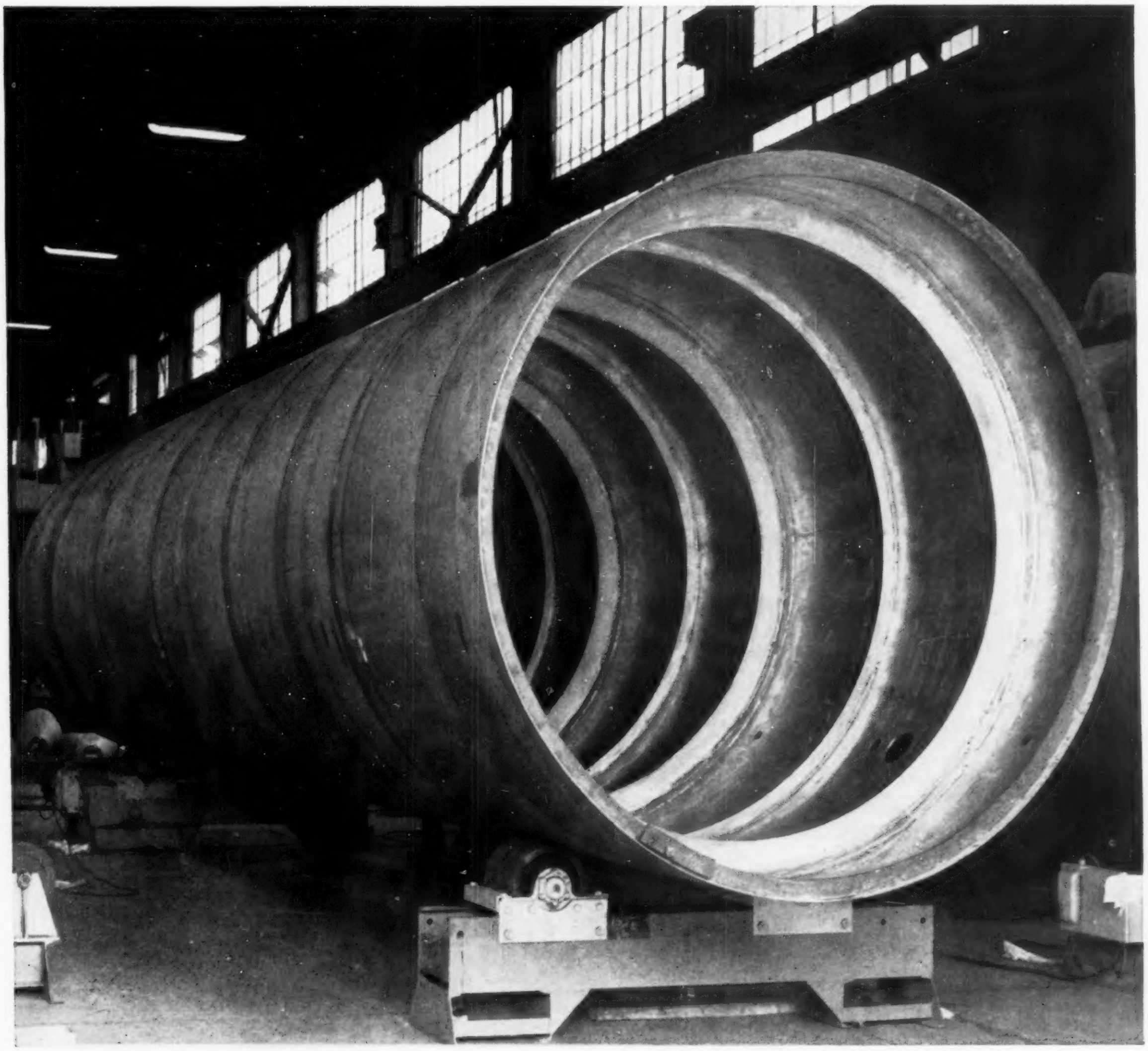
• Profit record. Something more than traditional measurements of credit effectiveness is needed, believes Kovac. Most important are the need to keep pace with the times, to conduct creative credit research, to develop new criteria for measuring credit effectiveness, and above all, to help management cash in opportunities that may be offered by an expanding economy.

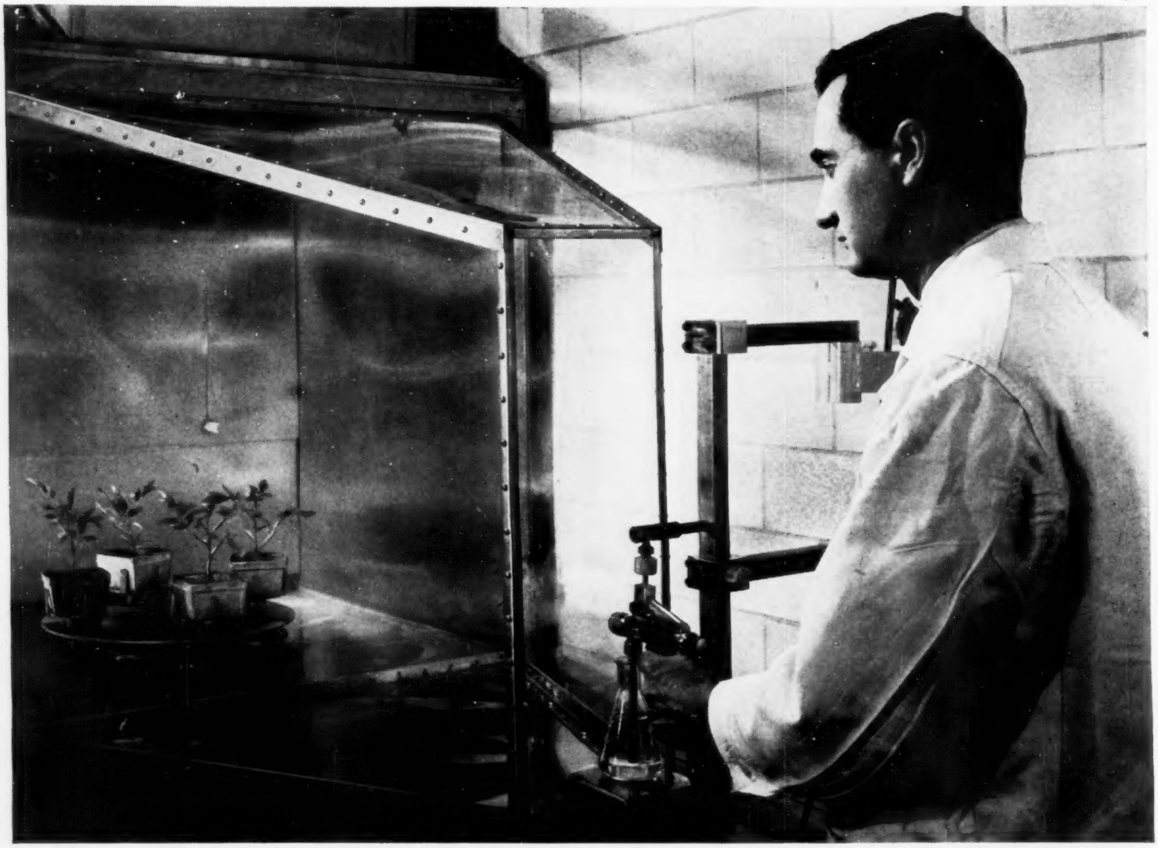
Back in the home office this week credit managers are keenly aware of the current business slump. If the attitudes at the meeting are any indication, it's clear that most credit men will be pushing hard for more sales, doing the best they can with a sticky collection situation.

## DATA DIGEST

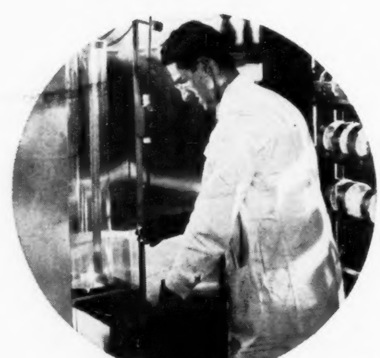
• **Glass enamels:** Supplement to book, "Lead in the Ceramic Industries" describes chemical and physical properties of enamels for glass applications, formulation of special properties by varying characteristics of the flux. Lead Industries Assn. (New York).

• **Alumina silicates:** Specially refined hydrous alumina silicates are discussed from viewpoint of chemical and physical properties, dehydration reactions and particle-size distribution. Applications are suggested as fillers. Summit Mining Corp. (Carlisle, Pa.).









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# Market
## Newsletter

CHEMICAL WEEK
March 8, 1958

**The polystyrene price situation is a lot steadier this week**—and most marketers are breathing easier. The happy outcome, though, was in some doubt during the past week or more, ever since Dow cut tags ¾¢/lb. on three important formulations of general-purpose polystyrene (Styron 666, 666M, and 689.)

The move, which will soon be followed by all other major producers (including Bakelite, Koppers, and Monsanto), in essence makes industry-wide the general formulation prices that Foster Grant has quoted since July '57: crystal at 24¼¢/lb., color 27¼¢/lb.

Market concern—and it is also reportedly reflected in consumer reluctance to make any commitments until the pricing picture cleared—centered on the possibility that Foster Grant would reduce its prices, re-establish its long-standing differential with other makers.

Foster Grant, however, tells *CW* that it doesn't plan to revise its schedules, is "happy that the trade has come to realize that our prices are, and have been, more realistic."

A quick *CW* check reveals this industry sentiment: "Since it's fairly certain that the polystyrene molding resin prices will be stabilized for a while—let's get back to doing some business."

•

**It's trade knowledge that glycol types of antifreeze tags will drop** April 1, although Dow's plan to initiate the action was not released to the trade press generally. Upcoming prices: c.l. or t.l. lots of gallon cans, $1.365¢/gal.; in bulk quantities, $1.105¢/gal.

The reduction amounts to 1½¢/gal., and was made, Dow says, "to strengthen its marketers' position in an increasingly competitive market." (The firm doesn't sell the antifreeze compound under its own label, but makes and packages the product under private labels for wholesalers.)

That the antifreeze market is rough (and will likely get rougher) is underscored by the quick, albeit reluctant, decision of other major packagers to match Dow's new price list; all customers of Union Carbide Chemicals, for example, got the reductions early this week.

•

**Higher contract prices on DDT will likely be general on April 1.** Indicative: a second major producer (Montrose Chemical) will boost its tags on that day, following Diamond Alkali's announcement.

Prices (which some spot customers are already paying): bagged flake material in c.l. or t.l. lots, 22¢/lb.; powdered, 23¢. Firming of the DDT market is being attributed to exporting of substantial quantities and the prospects that domestic requirements will increase in the spring.

## Market

### Newsletter

(Continued)

**Benzene hexachloride (BHC) prices will also go higher** with second-quarter schedules. Last week, Frontier Chemical announced that both high- and low-gamma BHC will cost 0.825¢/unit, up 0.075¢/gamma unit over current tags. The increases apply to export and domestic sales, with freight allowed in carload and truckload quantities to any destination in the U. S.

**Antiskinning agents for paints now cost less;** and the cuts are deep. National Aniline Division (Allied Chemical) has slashed the delivered price on its National Anti-oxidant B to 90¢/lb. in drum lots, a reduction of 23¢. Also down (by 13¢/lb.) is the firm's drum-lot price on National ASA, now selling at $1/lb. Prices on c.l. and t.l. quantities are 1¢/lb. below drum quotes.

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**Synthetic detergent sales climbed again in '57,** widening the lead over soap products. Syndets now supply approximately 71% of the total market. These statistics are reported in the latest Assn. of American Soap & Glycerine Producers sales census of some 70 manufacturers; their business represents, the group says, "a substantial portion of the industry's volume."

Total soap and synthetic detergent sales in '57 amounted to nearly 4.105 billion lbs., 3.3% ahead of the '56 record. The combined dollar-data: $998,115,000, up 9.3% over that of '56.

Syndet sales (solids and liquids) hit a new tonnage high of 2.916 billion lbs., 8.4% above '56's, while dollar sales climbed 14.4%, to $683,-590,000.

Soap slipped on both counts: sales (solids and liquids) in '57 dropped 7.5%—didn't quite touch 1.189 billion lbs.—and also were down 0.5%, dollarwise, to $314,525,000, compared with the previous year's $316,091,000

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**U.S. aromatics capacity gets another boost** the middle of next month when Ashland Oil & Refining's new 21-million-gal./year plant at its Frontier Division refinery (Buffalo, N.Y.) begins operations. Benzene, toluene, xylene and heavier aromatics, says the company, will be produced "in varying ratios as required by market conditions."

**SELECTED PRICE CHANGES—Week Ending March 3, 1958**

| | Change | New Price |
|---|---|---|
| **UP** | | |
| DDT, flake, bags, c.l. spot | $0.01 | $0.22 |
| DDT, pwdr., bags, c.l., spot | 0.01 | 0.23 |
| **DOWN** | | |
| Glycol-type antifreeze, bulk, c.l., t.l., gal. | $0.015 | $1.105 |
| p-Nitrotoluene, dms, works, tech. | 0.03 | 0.30 |

All prices per pound unless quantity is stated

# We are 100 years old in 1958

And here is our birthday resolution: To make our second century a still better one for our customers, our friends, our family of employees and our company.

It feels *good* to reach a hundred. To live and grow that long, it must be that we have created products and services that benefited many people.

In creating those products, we have had the help of generations of able, skilled Bemis employees. They have been essential to our progress and we appreciate their fine contribution.

We have tried to develop and make *better* packages and other products for the benefit of our customers, and in turn, *their* customers. To whatever extent we have succeeded, we are gratified.

The years have given us opportunity to make uncounted friends . . . most excellent friends . . . and these we prize beyond expression.

But most of all, these years have permitted us to develop the experience, the facilities, the talented personnel, the leadership to let us do an even better job in the second hundred years.

The Bemis Centennial Emblem represents this aim. It is an open book, symbolizing the story of Bemis . . . the 100-year bookmark placed to indicate that the story will continue into another century of service.

**Bemis**

100
1858
1958
ENTERING
OUR
2ND CENTURY
OF
SKILL
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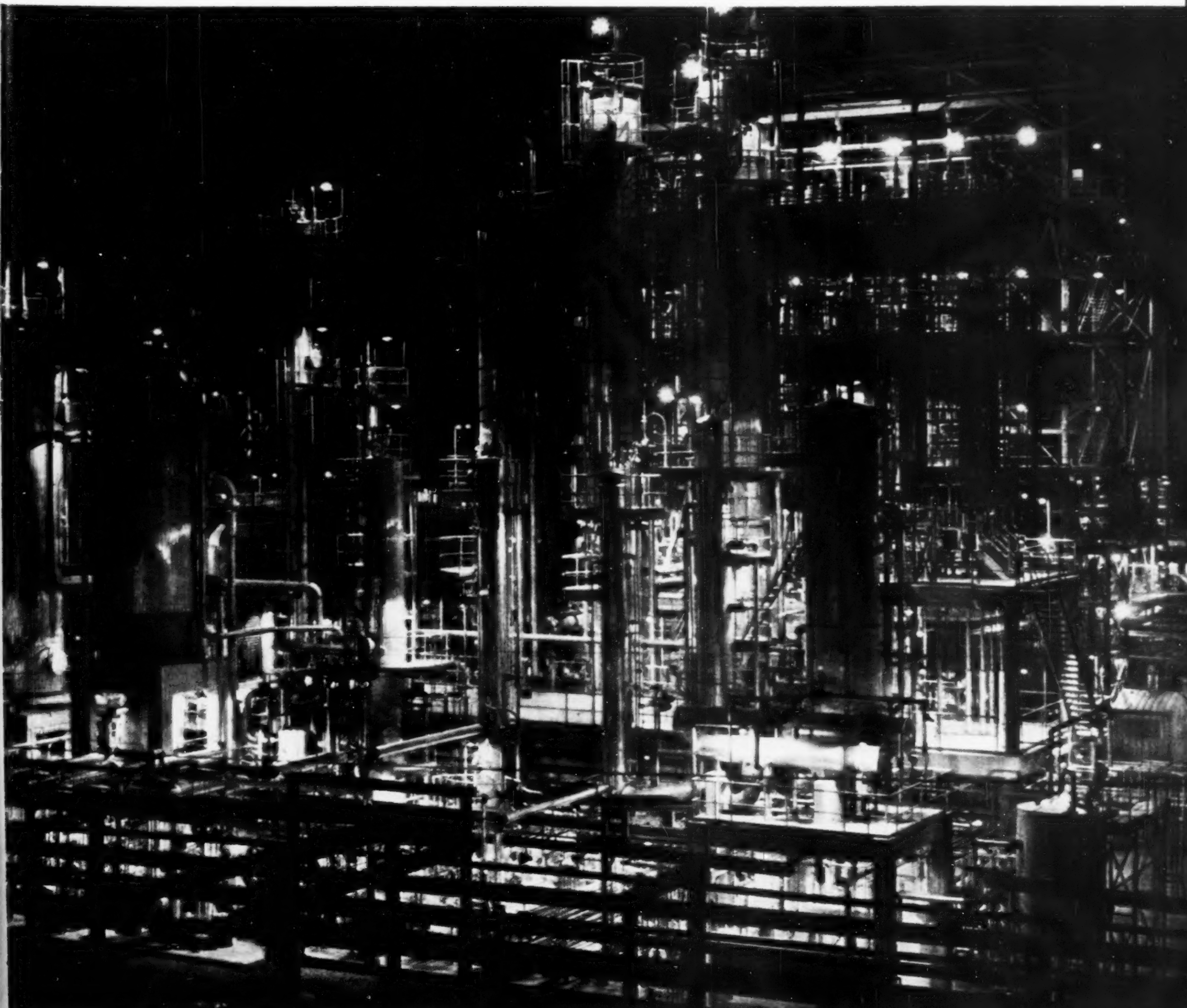
PROGRESS
BEMIS



Synthetic fibers boom caused Chemstrand to expand nylon capacity 128% at Pensacola.

# man-made fibers weave glowing future

by Eugene Schwarz

**Last year's production level of man-made fibers—rayons, acetates, synthetics and glass—was 1.8 billion lbs./year, a record high. By 1975, this figure will be small by comparison. By then, the two main fiber groups (rayons and acetates; and synthetics) should each support production close to 2 billion lbs./year. Total man-made fiber production will be riding at 4.6 billion lbs./year. Glass and other inorganic fibers will fill the 600-million-lbs. gap to make up the formidable total.**

Today, the wholly synthetic fibers (e.g., the polyamides, acrylics, polyesters and polyvinyls) have already swept past the 500-million-lbs./year production mark—515.6 million lbs. in '57, to be exact. Actually,

# Man-Made Fibers Weave a

it was less than 20 years ago that the first synthetic, nylon, became a commercial reality. It took the cellulosics (rayon, acetate and cuprammonium fibers) nearly twice as long to reach roughly the same production volume that the synthetics enjoy today. The cellulosics are still far ahead of the synthetics in output (1,139 million lbs./year in '57; 77% in rayon, 23% in acetate). But the growth potential of the synthetics between now and '75 is nearly four times as great as that of the cellulosics.

How much of an impact does chemical fiber production make on chemical industry? According to the U.S. Dept. of Commerce, in '54 the 45 companies in the industry shipped products valued at $1.2 billion; value added by manufacture figured $720.5 million; expenditures for new plant and equipment hit $62.7 million.

According to a recent market research study by Lester Berger, of Union Carbide Chemicals Co., total chemical purchases by the textile industry in '55 broke down like this: $1.9 billion for synthetic fibers; $211 million for textile processing chemicals; $175 million for dyes and finishes. Of the $211 million worth of processing chemicals purchased by the textile industry, $156.2 million was spent for inorganic chemicals.

In this group, purchases were allocated as follows: $35 million for starches, modified starches and gums; $24 million for soaps and syndets; $19 million for sulfuric acid; $17.2 million for phosphates and silicates; $15 million for lubricants; $15 million for other organic salts; $10.5 million for bleaches; $7.5 million for caustic soda; $13 million for miscellaneous inorganic chemicals.

Some 81 plants located in 19 states make up the backbone of the man-made fibers industry. What makes this industry tick? What are its strengths and weaknesses in today's economy? Where is man-made fiber production heading? What production, marketing and research problems confront producers? How tough is foreign competition? Answers to these and other key questions are forthcoming in this CW Report.

Special emphasis is given the fully synthetic fibers made from organic-chemical raw materials. Rayons, acetates and related fibers are not overlooked, however. Inorganic fibers of glass, metal oxides and carbon are also included, as are vegetable and animal protein-based fibers.

The term "fibers," as used here, refers to all forms, shapes and lengths of the materials that are commonly produced and marketed today—continuous filaments, mono- and multi-filaments, staple and tow.

## LONG-RANGE TRENDS

**Today, man-made fibers account** for about 30% of the total U.S. fiber market. This share will grow—to close to 50% by '75. But total replacement of natural fibers (cotton, wool and silk) is not in the foreseeable future. Whether this prospect will ever materialize is conjectural. Cotton is still the largest-volume seller (4.3 billion lbs. in '57) of all fibers. It fills 65-70% of total fiber demand. All signs indicate, however, that total cotton production will increase but little from its present level.

Rayon staple, which sells for 1 to 3¢/lb. less than cotton, has already beaten cotton out on price. And yarn mills that have switched to rayon from cotton have cut their processing losses in half. Government cotton price supports, too, are helping the man-made fibers vanquish their oldest competitor.

While viscose staple prices have increased slightly more than 25% since '38, cotton prices have nearly quadrupled. Over the same period, acetate staple prices decreased more than 30%. Discounting inflationary influences, the over-all price trend for fully synthetic fibers is steadily downward as higher volume, lower processing costs and interfiber competition come into play.

Conceivably, lower cotton prices could somewhat revive demand for it, but this should not materially affect the long-range growth outlook for man-made fibers. Reason: man-made fibers offer special properties—unusually high strength, excellent resistance to mechanical and chemical action, and flexibility in blending with natural fibers. Liabilities include generally high unit price and shortcomings in some characteristics (affinity for dyes, primarily).

Any hikes in cotton prices (not entirely unlikely) could swell demand for man-made fibers, especially the rayons, far beyond predictions.

Industrial and nontextile applications of fibers (e.g., nonwoven fabrics, paper uses, fiber-reinforced plastics) are growing apace and can be expected to take a greater share of the future market than they do now. By '75, some sources estimate, 3 billion lbs./year of fibers will be used in conjunction with plastics alone. If true, this would considerably alter forecasts of future fiber outputs. Disposable wear offers tremendous market potential, too.

On the dim side of the forecast, fibers can expect increased competition from plastics in such items as shower curtains, raincoats, containers of different kinds, luggage and seat covers. But any losses here will only partly offset gains in fiber output foreseen from rapidly building industrial markets.

In comparing the gains made by synthetics as replacements for natural fibers in industrial markets, two important considerations must be kept well in mind:

(1) The covering power of wholly synthetic fibers is usually higher than that of other fibers because of their lower specific gravity. This means that more yards of fabric can be made from the same weight of synthetic.

(2) Fully synthetic fibers outlast other fibers. As a result, replacement tonnages of synthetics increase at a slower pace.

In the chart of projected output for fibers on p. 96, *per capita* demand figures were used together with population growth figures to estimate the '75 production level for various fibers —rayons, synthetics, glass, cotton and

# Glowing Future (cont.)

wool. *Per capita* consumption of man-made fibers in '57 is estimated to have been 9.4 lbs., compared with 35 lbs. of all fibers. How much such properties of synthetics as covering power and wear resistance will influence *per capita* consumption is anyone's guess. But the basis for projections is that *per capita* fiber demand will remain relatively constant, at today's level.

## RAYON OUTLOOK IMPROVES

**Rayon and acetate producers** continue to retain a strong grip on the big market for fibers—textiles. And in industrial markets, too, they're bent on stemming the advance of synthetics. Improved rayons and widely publicized comparative-test results are mainly responsible for consumers' taking a "second look" at the low-cost cellulosics. A complete listing of rayon, acetate and cuprammonium producers appears on pp. 104-105.

Viscose staple capacity is still expanding. It was gauged at 430 million lbs./year in '57 and should hit 550 million lbs./year by the end of '58. Rayon is closest to cotton in textile properties (strength, spinning ease, affinity for dyes and moisture absorption). And, rayon is available in an almost endless variety of forms, deniers and shades. Stable price and high product uniformity also favor rayon's continuing importance.

All these are key factors in the competitive picture, but another one — cost—overshadows them. Rayon is still the lowest-cost fiber available today for the many textile and industrial uses that demand economic fiber materials. Conceivably, rayon could become still cheaper in price (perhaps 10%), a good possibility as producers shift more to continuous processes.

Pulp and rayon producers are making a concerted effort to further improve rayon properties, especially wet and dry strength. In addition, finishing processes are getting a deal of attention. Goal: a 100%-washable rayon.

In the important industrial market, tire cord is the biggest rayon outlet; industrial belting and hosing is second. In '57, 310.5 million lbs. of viscose rayon yarn were sold for tires and related uses. This is a 29% drop from the '53 high of 439.8 million lbs. of rayon consumed for tires.

Rayon producers have been fighting a pitched battle to stem the advance of nylon in tire cord. In rayon's favor, claim producers:

(1) Low cost.

(2) Greater mileages attained from rayon-cord tires in comparative tests.

(3) Rayon's nonthermosetting properties. Flat spots, they claim, do not develop in hot rayon-cord tires, when they cool in place.

(4) Higher heat resistance.

(5) Ease of retreading.

Recent data gathered by rayon producers is said to reveal that high-performance rayon equals nylon for impact resistance. Despite rayon's claimed advantages, nylon producers are still counting on making greater inroads into the tire-cord market.

In both markets, industrial and textile, the main emphasis of rayon producers is on development of higher-strength yarns. Last June, for example, American Viscose introduced its high-performance rayon filament yarn, Super Rayflex. The product's conditioned strength is pegged at 4.5 grams/denier, well above average. American Enka is plugging its recently introduced Super Suprenka, an ultra-high-performance tire-cord yarn.

Fortisan and Fortisan 36, new high-tenacity-type Celanese rayons, are being promoted for industrial fiber uses. Outlets include military tenting, V belts, tarpaulins, safety belts, electrical core threads, fire hoses, and freighter hatch tents (reinforced with vinyl coatings).

Rayon producers' principal textile markets are in apparel, linings and home furnishings. The textile outlook is still less than bright. American Viscose, leading U.S. rayon producer, says its textile rayon sales have slipped to 35% of its total sales. It used to be much higher.

Rayon producers continue to vigorously tout their spun-dyed fibers for textile uses. Spin dyeing of rayon staple was introduced here from England after World War II by Courtaulds (Alabama). Today, most rayon processors supply spun-dyed viscose staple in an almost infinite variety of shades and for many uses, including carpet manufacture.

Expanding markets for spun-dyed rayons have perked up rayon producers' hopes. Blends of spun-dyed viscose rayon with nylon and cotton are going strong in stretch socks for men. Automobile manufacturers are using spun-dyed viscose rayon in car upholstery. The home furnishings market is consuming more and more spun-dyed viscose. Spin dyeing is also behind rayon's comeback in women's apparel.

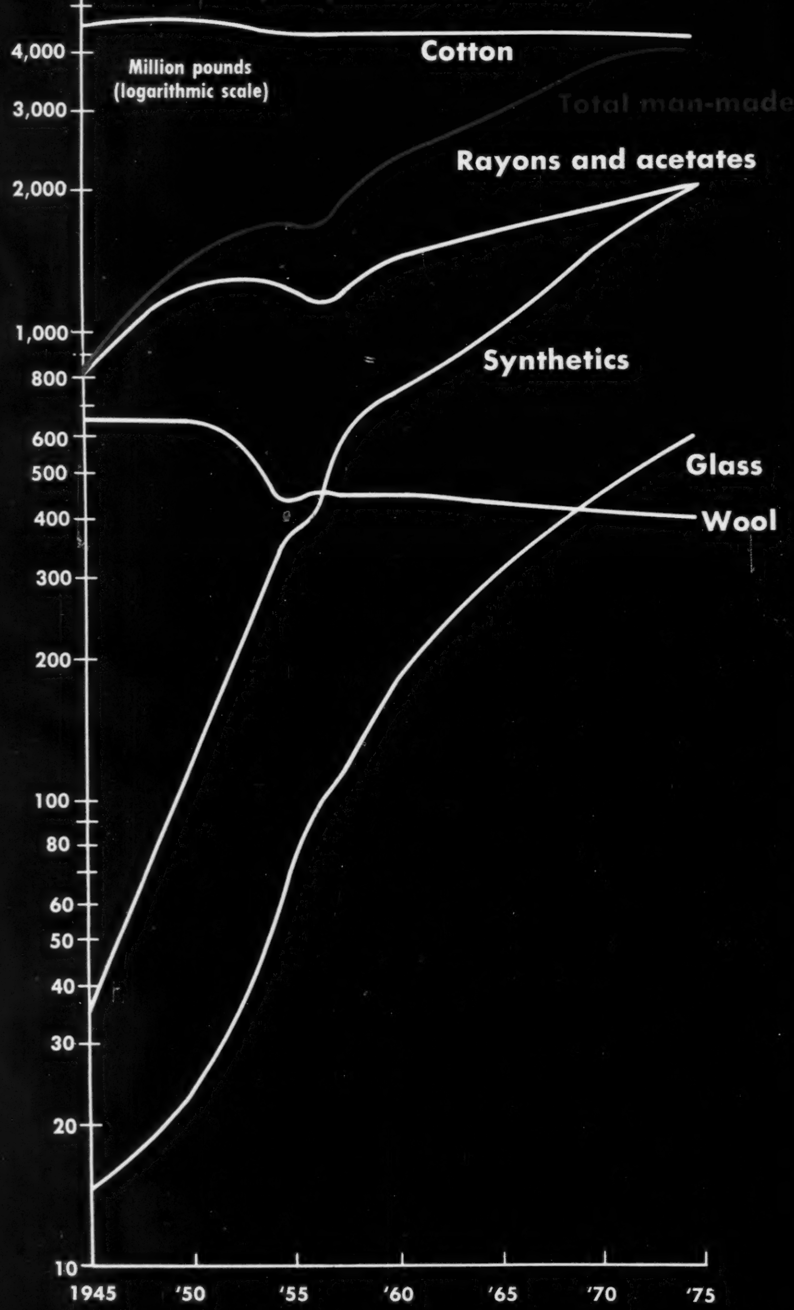
**Cuprammonium Rayon:** Although cuprammonium rayon (produced in the U.S. only by American Bemberg) has been losing ground abroad for some time now—15 to 20 years, in fact—it still maintains a strong position in this country. Reason: the cuprammonium process provides quality rayon in fine denier. Special yarns (called "thick and thin" because their denier changes within the filament) are just beginning to regain new popularity in the U.S. for the cuprammonium types. Irregular texture of "thick and thin" yarns results in linenlike fabrics. Bemberg's "thick and thin" Cupioni and Strata are offered in a full range of spun-dyed shades, produce shantunglike fabrics. Bemberg is the only rayon vat-dyed by the manufacturer. All other rayons are dyed by dyers and processors.

Cuprammonium yarns are making their biggest comeback in blends. Typical is Cordoni, a blend of rayon, acetate, nylon and Cupioni. This combination is used for cord suiting. The currently popular silklike fabrics for men's wear are blends of Dacron, cotton and cuprammonium rayon.

To further expand cuprammonium rayon markets, cuprammonium rayon finishers are busily perfecting finer finishes. Resinating, direct dyeing and silicone treatments are among them. The silicone finish, for example, makes

## 1975 Outlook for Fibers

**Chemicals producers can expect a 4.6-billion-lbs./year production of all man-made fibers. Synthetic and cellulose-based fibers will account for 2 billion lbs./year apiece. Glass fibers will have reached 600-million-lbs./year production by 1975.**




for easy sewing of cuprammonium fabrics, enhances their feel.

**Acetate:** Acetate demand leaves much to be desired. Last year, Tennessee Eastman discontinued its acetate staple production altogether. Acetate filament, on the other hand, is getting a new lease on life as a spun-dyed yarn. An estimate indicates that 30% of today's acetate filament is spun-dyed.

Acetate production reached a peak in '50 (443.4 million lbs.). Since then, production has slipped off to a current level of about 261.8 million lbs./-year. The newly revived interest in women's crepe and chiffon apparel should give acetate rayons a badly needed market lift this year.

Celanese is promoting a new "thick and thin," 200-denier, spun-dyed acetate yarn for textured, lightweight fabrics that can withstand heavy launderings and prolonged exposure to sunlight. Another new Celanese acetate fiber (Type F), with a Y cross-section, exhibits high bulk and good hand. The company offers this product for home furnishings.

Du Pont has introduced a similar yarn, Type 20. Special spun-dyed acetate yarns for the carpet trade are available from Eastman and Celanese. Each of their products may be twist-set, blended with wool and nylon for use in tufted carpets.

Celacloud and Celafil are two other new Celanese acetate fibers. They're going into mattress stuffings, upholstery, quiltings and other uses that require both resiliency and bulk. Eastman's new yarn, Eastman 50, is a doughnut-shaped acetate filament that imparts high luster and bulk to fabrics.

**Other Acetates:** Arnel, the cellulose triacetate fiber introduced by Celanese a few years ago, is still in the market development stage. It offers some unusual properties. The triacetate is unaffected by chlorine, even at 100 C. It can be heat-set and will pleat permanently. It meets wash-and-wear requirements well, both in blends with cotton and alone.

**Rayon Outlook:** Low cost, the current comeback of crepes and chiffons for women's wear, the high performance characteristics of the newer high-tenacity rayon fibers, the inherent high style appeal of spun-dyed rayons, all should combine to give rayon pro-

ducers a strong bulwark against the further loss of sales to the synthetics.

Rayon manufacturers are backed in their sales drive by rayon pulp producers, who have a high stake in improving the competitive position of their rayon- and acetate-producing customers. Rayonier, for example, offers pulps that are specially tailored for producing the new washable rayons now in early stages of commercial development. Rayon producers have long eyed the wash-and-wear market—a market the synthetics created by dint of their inherent hydrophobic properties.

## NYLON IN VOLUME

**Nylon** is the only wholly synthetic fiber to have reached what might be called, by fiber industry standards, "volume" production. Producers have pushed nylon fiber tonnages up from near zero in '39 to close to 300 million lbs. last year.

That ranks nylon second only to viscose rayon in man-made fiber production. Viscose production was 877.6 million lbs. in '57. Acetate rayon output is now relegated to third place—261.8 million lbs. last year. Nylon, of course, has plastics applications, too; but they are not considered here.

The two types of nylon made in the U.S. today are nylon-66 (Du Pont's well-known fiber) and nylon-6 (originated in Germany in '40 and called Perlon in Europe). Nylon-6 accounts for roughly 10% of all nylon production. U.S. firms, Du Pont and Chemstrand, produce nylon-66, while nine manufacturers supply nylon-6 (*see list of polyamide producers, p. 106*).

Here's what distinguishes the two nylons from one another:

(1) Nylon-66 is synthesized from adipic acid and hexamethylene diamine, whereas nylon-6 is synthesized from caprolactam.

(2) While their over-all properties are very similar, nylon-6 has a slightly lower melting point, is somewhat softer in feel and has a slightly better affinity for dyes.

Nylon producers are exuding confidence. Not only are the two nylon-66 producers reportedly "sold up" at their present production rate, they're also anticipating, or have just effected, sizable expansions (*see table, p. 106*).

Several factors are behind nylon's strength in the highly competitive, often-erratic textile market. The revival of demand for "soft" fabrics is favoring nylon sales. New nylon fibers have been developed to further expand the selection for women's hosiery. American Enka's brand-new hosiery yarn, for example, is a two-filament yarn which, the manufacturer claims, is less bright, fits better and is more silklike than the corresponding monofilament nylon hosiery yarn.

Another factor currently contributing to nylon sales success: texturizing processes that give nylon (and other synthetics) high bulk. Improvement of bulking is mainly responsible for the recapture of important apparel markets (especially sweaters).

Staple output now amounts to about 10% of total nylon production. And new types of nylon staple are being developed. Case in point: Du Pont's high-tenacity nylon-420 staple. It was developed especially for cotton-rayon blends and ended up in work clothing.

In nonapparel markets, too, nylon is making important gains. Its resiliency, abrasion resistance, toughness and moth resistance make nylon a prominent contender in carpet manufacture. In blends with other fibers, it increases carpet life. Both Industrial Rayon Corp. and Allied Chemical are making strong bids in this field with their high-denier, texturized and bulked yarns that create interesting carpet effects.

The industrial market is one that nylon producers easily cracked. Largest single industrial market for nylon: tire cord. But while nylon-66 has had free play in this market so far, nylon-6 is now trying to edge in. 60 million lbs./year of nylon-66 go to this end-use, with more to come. Since 0.6 lbs. of nylon replaces 1.0 lbs. of rayon yarn, these 60 million lbs./year of nylon represent a replacement of 100 million lbs./year of rayon. It's easy to see why rayon producers are concerned about nylon's advance in their big industrial market. Yet, they can expect further inroads from nylon-6 suppliers, who report growing acceptance of their product for tire uses.

Du Pont makes no secret of seeking a still-larger share of the tire-cord market for its nylon. The company claims that nylon-66 has almost completely replaced rayon in airplane tires and that 30% of all operating trucks and buses use nylon tires. A pioneer in developing high-tenacity rayon for tires, Du Pont still has a stake in the rayon tire-cord market. But the firm seems prepared to yield this to nylon. Other industrial uses for nylon are myriad and growing. Coated nylon fabrics for truck covers, sports arena covers, pneumatic buildings, etc., are important in this regard. Use of nylon for towing and mooring ropes is increasing in stride with the pleasure boating boom. In marine applications, 1 lb. of nylon replaces from 4-9 lbs. of manila fiber. Nylon is stronger, lighter, and resistant to rot and sea water. Even though initial cost is much higher, nylon ropes are less costly to use in the long run.

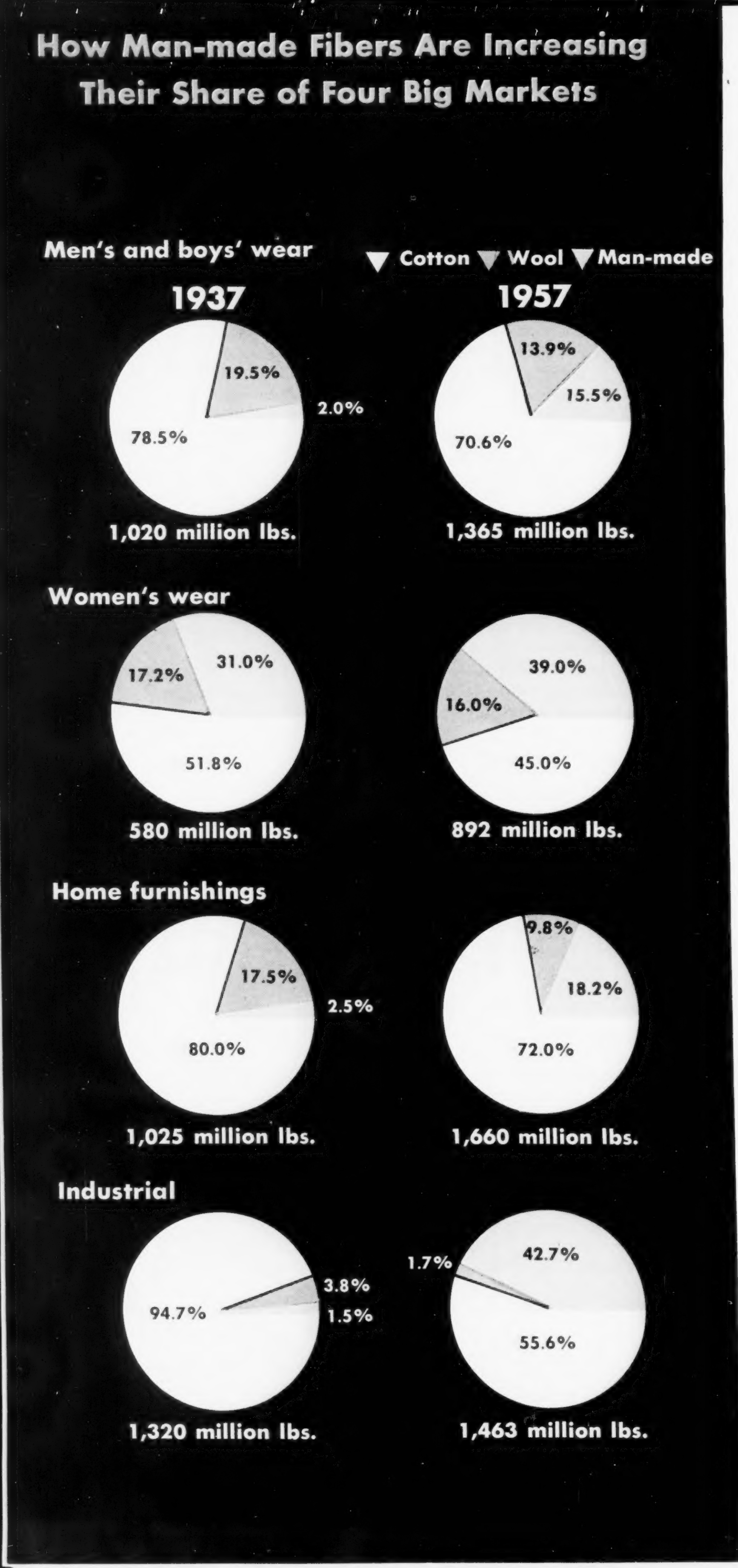
**Nylon Outlook:** Despite shortages in nylon supply, a great diversification of end-uses continues to boost production and capacity at a rapid clip. Total nylon capacity is now estimated at about 350 million lbs./year, with about 10% additional capacity due onstream this year. By filling out denier ranges, producers have expanded markets in the knitgoods industry. Development of spun-dyed colors (including black), stronger staple types, no-break yarns, improved dyeing processes that yield uniform and wash-fast shades are all contributing to nylon's growth. The development of textured yarns, bulked and crimped yarns, is giving still greater impetus to an already-steep growth rate.

Further strengthening the nylon outlook: extreme high-temperature research has lately uncovered the startling fact that nylon- and Orlon-reinforced phenolics withstand temperatures of around 15,000 F better than glass- or asbestos-reinforced plastics. Thus, the noses of missiles may soon wear nylon or Orlon "sweaters."

## ACRYLICS COMING UP FAST

Acrylic fibers have shown the second-biggest (to nylon) growth gains of all synthetics since they were commercially introduced (by Du Pont in '50). All acrylic fibers are basically acrylonitrile polymers or copolymers with other additions.

By early '59, the six U.S. acrylic fiber producers (*see listing on p. 105*) will have in-place capacity estimated




at a maximum of 212 million lbs. a year, a minimum of 177 million lbs. a year. Du Pont alone, however, will account for roughly 60% of all acrylic fiber capacity onstream by that date.

**Orlon:** Orlon production last year reportedly reached 70 million lbs., should exceed 100 million lbs./year after Du Pont's Waynesboro, Va., plant is in (due onstream in mid-'58 with a capacity of 40 million lbs. a year). Du Pont's Camden, S.C., plant has twice Waynesboro's capacity.

Many of Orlon's gains in the fibers market are attributable to unique properties. Of these, resistance to outdoor exposure is probably the most outstanding. Good bulking characteristics, a relatively recent improvement, account for the fiber's success in knitted fabrics. One spinner estimates that the total consumption of Orlon for sweater uses is something like 45 million lbs./year.

Du Pont-sponsored application research, in cooperation with textile producers, is broadening Orlon markets. The same can be said for the new 6- and 10-denier Orlon yarns. Until early last year, Orlon was produced in both filament and staple. But Du Pont has since discontinued Orlon filament production because the 100% acrylonitrile filament proved too hard to dye. Small amounts of vinyl pyridine or vinyl acetate are copolymerized with acrylonitrile to produce staple yarns with improved dyeing properties. Orlon filament production will probably stay on the shelf until Du Pont can improve filament dyeing.

In other areas, rapid Orlon dyeing progress is being made. Last year, a staple and tow were introduced with purer whiteness and greater affinity for cationic dyes. A 30% greater dye saturation and greater dyeing speed are claimed for these products.

**Acrilan:** Chemstrand Corp., the jointly owned (50-50 by Monsanto and American Viscose) company that last month startled financial circles by issuing a public annual report, ranks second to Du Pont in acrylic capacity. By the end of '58, Chemstrand's Acrilan acrylic fiber capacity will have hit 45 million lbs./year.

Like Orlon, Acrilan is gaining acceptance as a knitting fiber (sales to jersey fabric manufacturers are reportedly 50% higher than they were

a year ago). Men's sport shirts made of 100% Acrilan or blends of Acrilan with other fibers—silk, for example—are going strong in the apparel market.

Quick consumer acceptance of 100% Acrilan carpets (introduced just last year by Firth Carpet and Cabin Craft companies) has convinced Chemstrand that the floor-covering market offers big potential for its fiber. Good covering power and favorable dyeing properties permit easy coloring with acetate and basic dyes. Piece dyeing of tufted carpeting with vat colors is also possible. Another point in Acrilan's favor in the carpet trade: twisted yarns can be heat-set to produce special textured effects.

Chemstrand recently unveiled its latest acrylic staple, Acrilan Mark III, specifically tailored for use in blanket manufacture. It provides bulk combined with warmth and lightness, is washable, shrink-resistant and can be machine dyed.

**Dynel:** Despite its "conservative" place in the synthetic fibers picture, UCC is doing a first rate job in promoting its dynel acrylic fiber. Capacity is 6-8 million lbs./year. It is 40% acrylonitrile, 60% vinylchloride; but composition could change, probably moving toward a higher acrylonitrile content.

Dynel exhibits outstanding chemical properties (especially resistance to acids), nonflammability, moth resistance and inertness to light. Produced in a number of types, some of them heat stabilized, it will not shrink even in boiling water.

As far as textile properties are concerned, dynel exhibits satisfactory wet and dry strengths, is resilient and warm in fabrics. Dye affinity, however, is somewhat limited; disperse acetate dyes are needed for best dyeing results. UCC supplies dynel in a number of spun-dyed shades to overcome this disadvantage.

A big potential market for dynel is in apparel. It now finds outlets in high-pile fabrics (synthetic fur coats and collars, for example), either as 100% dynel or blended with other fibers—e.g., Orlon. In blends with wool and other fibers, Carbide's acrylic finds its way into the home furnishings market.

The biggest potential Dynel markets, however, seem to be: (1) industrial fabrics; (2) protective and work clothing; (3) other special applications. Another noteworthy application is in "straw" hats, where extreme lightness, shape and color retention and flexibility are demanded. Also promising are experiments with dynel as a stock for men's hat felts.

Another original dynel development: a fabric that closely resembles Persian lamb. It's made from 100% dynel chenille fastened to a woven cotton backing.

Even with this broad base of outlets, development work to further expand dynel usage continues in a variety of ways. New types and fiber sizes, new dye carriers and antistatic agents for dynel are all in the works.

**Three New Acrylics:** American Cyanamid's Creslan, Tennessee Eastman's Verel and Dow's Zefran are recent entries into the acrylic fibers arena. American Cyanamid will supply Creslan from its Stamford, Conn., pilot plant until its Pensacola, Fla., unit (capacity: 27 million lbs./year) comes onstream early in '59. Tennessee Eastman produces Verel at a Kingsport, Tenn. (capacity: 12-15 million lbs./year), plant that came onstream last year. Dow will rely on its Pittsburg, Calif., pilot plant to produce Zefran until its Lee Hall, Va., facilities (estimated capactiy: 12-15 million lbs./year) begin to operate this year.

**Creslan:** Offered originally as fiber X-51, later as X-54, Cyanamid's Creslan is a copolymer of acrylonitrile and other acrylates (methacrylamide, for example). Creslan processing differs from that of the other acrylics; the polymer is dissolved in salt solutions (sodium thiocyanate is one) and wet-spun into supercooled aqueous coagulating baths.

Creslan's properties are essentially those of a modified acrylic, except that its over-all dyeing properties are claimed to be better than those of other acrylics.

The fiber is resistant to chemicals and abrasion, but still possesses an affinity for dyes. Good strength, resistance to acids and alkalis, fire resistance and good dimensional stability should further strengthen Verel's competitive position among the fast-growing acrylic fibers.

Fabric development and wear tests suggest potential outlets in suiting and in dress fabrics, knit goods, pile fabrics and blankets. These products could be made from 100% Creslan or from blends of the fiber with rayon, wool, etc.

A Creslan of improved whiteness and 15-denier carpet staple fiber are said to be ready. Acrylic fiber producers can expect the first commercially available Creslan fabrics to reach consumers late in '58.

**Verel:** Markets for Tennessee Eastman's Verel ( a modified acrylic fiber) differ but little from those of the other acrylics. Typical outlets: men's hose, drapery fabrics, rugs of 50-50 Verel-Acrilan blends, jersey fabrics of Verel-wool combinations, pile-lined fabrics and women's tweeds. Tennessee Eastman plans to supply a 16-denier staple for carpets.

Verel reportedly has twice the moisture regain of other acrylic fibers, in addition to excellent whiteness, a pleasant feel and controllable heat shrinkage. And the fiber permits different degrees of bulking.

**Zefran:** Dow describes Zefran as a "nitrile alloy" fiber. High moisture regain, attributable to hydrophilic regions in the molecule, gives the fiber an affinity for dyes (direct dyes, naphtol-vat dyes, and premetalized neutral dyestuffs). Zefran blends well with both the natural and man-made fibers, contributes high bulk and dimensional stability to fabrics. It retains a press and exhibits good recovery after wrinkling, especially in blends with cotton, wool or rayon. Dow promises to have Zefran textile products on the market this year.

## MORE POLYESTER ACTIVITY

**Dacron, the polyester** Du Pont introduced in 1953, has long been the only commercial member of this synthetic fiber group. Estimated Dacron capacity at Kinston, N.C., is 50 million lbs./year. Feasibility studies are under way for a proposed $20-million Dacron plant at Old Hickory, Tenn. Dacron, in fact, ranks third after nylon and the acrylics, in volume of production. It's an ester of terephthalic acid and ethylene glycol.

The polyester picture is about to change, however. Tennessee Eastman is mill-testing its new polyester fiber,

T-900, now issuing from a Kingsport, Tenn., pilot plant. Patents to California Research Corp., a subsidiary of Standard Oil Co. of California, indicate still more polyester fiber activity from that quarter. CRC's process is based on isophthalic acid.

Originally a British development (the fiber is called Terylene abroad), Dacron was a sure-fire seller right from the beginning. Today, polyester fiber is in short supply here, in Canada and in Europe.

For satisfactory dyeing of Dacron, a carrier such as *o*-phenylphenol or benzoic acid is needed, along with accurate control. Alternately, some success has been attained by dyeing under pressure at 250 F. The volume use of polyester fiber is in blends with wool and the cellulosics. In these constructions, the dry cleaning and sublimation fastness of many dyes leaves much to be desired.

Blends of 65% Dacron, 35% wool were an immediate success both for men's and women's apparel. Today, 65% Dacron, 35% cotton (sometimes composition is further altered by adding nylon or other synthetics) seems best for various apparel. Improved dyeing methods and newer dyes are helping to improve the styling of these constructions.

What makes Dacron blends so popular? The fabrics are quick-drying, require no ironing. Quick crease recovery is another important plus.

Du Pont has sponsored a drive to get further consumer acceptance for synthetic fibers, especially Dacron, by promoting garment labeling. The company supplies free tags (to mills, converters and garment manufacturers), which spell out the actual synthetic fiber content of a blend.

This is a much-needed service for the textile and synthetic fibers industry: tags prevent the use of synthetic fibers as an attention-getting sales "gimmick." Now, mills are obliged to adhere to the minimum content of synthetic that Du Pont feels is essential for proper performance. Du Pont can refuse to sell its Dacron to mills that won't agree to use the product according to specifications.

Polyester fiber prospects seem bright indeed. Aside from dyeing problems that are slowly being licked, price could prevent the polyesters from becoming really big-volume fibers. Higher production volumes and much-needed competition will help.

## VINYLS MAKE A QUARTET

**Polyamide, acrylic and polyester** fiber producers, plus a fourth fiber group—the vinyls—make up the commercial synthetic fiber family. The saran-type fibers (vinylidene chloride-vinyl chloride copolymers) support a total capacity of around 30 million lbs./year, spread among seven producers (*see listing of producers on p. 107*).

Dow supplies the raw materials from which filament yarn (mostly monofilament), staple fiber and tow is produced in a variety of sizes and shapes. Saran-type fibers are strong, tough and durable, possess a high degree of resistance to chemicals, light and weather. They are used mostly in nonapparel applications: awnings, carpets, upholstery and furniture fabrics. One special use, in screening, looks promising to producers.

Household and office furniture manufacturers have sparked new interest in saran. Key feature here: the fiber's resistance to burning. Curtain and drapery materials for homes, offices and public buildings are other items exploiting saran's fire resistance.

## Synthetic and Glass-Fiber Capacities Are Growing Fastest

**Today, both fiber types account for 33.4% of all man-made fiber-producing capacity. By 1975, this share will grow to about 56.5%.**

| | 1954 | | 1957 | | 1975 | |
|---|---|---|---|---|---|---|
| | Capacity (million pounds) | Percent | Capacity (million pounds) | Percent | Capacity (million pounds) | Percent |
| Rayon and acetate | 1,651 | 76.3 | 1,535 | 66.6 | 2,000 | 43.5 |
| Synthetics | 439 | 20.3 | 627 | 27.3 | 2,000 | 43.5 |
| Glass | 73 | 3.4 | 140 | 6.1 | 600 | 13.0 |
| Total | 2,163 | 100.0 | 2,302 | 100.0 | 4,600 | 100.0 |

Sources: Textile Economics Bureau, Inc. (New York); CHEMICAL WEEK.

## OTHER GROWTH FIBERS

**The quartet**—polyamide, acrylic, polyester and vinyl fibers—account for the great bulk of today's synthetic fiber production. Other fibers, too, are bidding for acceptance, but have a long way to go before they make important contributions to total synthetic fiber production.

**Darvan:** Formerly called Darlan, this Goodrich Chemical fiber has been undergoing market development for about seven years. Described as a dinitrile by the manufacturer, it is actually a copolymer of vinylidene cyanide and vinyl acetate. Darvan's outstanding property: cashmerelike softness.

Development has concentrated on use of Darvan in deep-pile luxury coat fabrics, bulky knitted sweaters and hand-knitted yarns. It is also being tried in fabric blends with wool, cotton and other fibers.

While Darvan's fiber strength is sufficiently high for many textile applications, its dye affinity is admittedly limited. High resistance to weather, heat, insects, mildew and acids are other positive features. Flame resistance, however, is low, roughly equivalent to that of cotton. To speed market evaluation, Goodrich plans to triple Darvan production this year. The fiber is made in a pilot plant at Avon Lake, O.

**Teflon:** Du Pont's tetrafluoroethylene fiber, Teflon, displays outstanding resistance to heat and chemical action. It's made by a new method of fiber "spinning." The resin emulsion is heat-sintered rather than extruded, as is commonly the case in other synthetic fiber production.

Because of its unique qualities, Teflon has been well received for many industrial applications in which other fibers would be entirely inadequate. Examples: in the filtration of strong oxidizing acids and as packing for acid pumps. Fiber price is usually no object in such special applications. Du Pont's Teflon resin, like the fiber, is replacing other materials—even metals—for these highly specialized requirements.

**Polyolefin Fibers:** Much of the fanfare given to polyethylene fibers has been somewhat premature. Fiber applications of high-pressure polyethylene have been hampered by the lack of "textile" properties. Low melting point, poor dye affinity and poor dimensional stability render the high-pressure fiber unsuitable for apparel uses. Markets have been confined to special applications (ropes and cords), somewhat similar to saran's.

The recent advent of low-pressure polyethylene made by the Ziegler and Phillips techniques has improved the polyethylene fiber outlook. Low-pressure polyethylene offers higher melting points and more strength.

Much of the future success of polyethylene fibers will hinge on fiber manufacturers' abilities to stabilize polymer composition. Uniform polymers are mandatory for successful fiber production and marketing.

What makes the polyolefin fibers particularly attractive to synthetic fiber producers and users is their potentially low price and large demand. Montecatini (Italy) claims that its Moplen polypropylene fiber can be produced at an even lower cost than that of polyethylene fibers.

A long period of product and market evaluation (10 years is not uncommon for a new synthetic fiber) will be necessary to prove or disprove the Italian company's expectations. Should Moplen meet all the demanding requirements of a commercial fiber, and still be available at low cost, polypropylene fibers could become another volume fiber group.

Dawbarn Bros. (Waynesboro, Va.) is the largest producer of high- and low-pressure polyethylene fibers and yarns. The firm is now busy developing a multifilament polyethylene yarn and has recently developed a "ribbon" yarn intended for shoe fabric manufacture. Dawbarn and Reeves Bros. (another big factor in polyethylene fiber production) are both planning to expand their polyethylene fiber facilities.

Usage of low-density, branch-type polyethylene filaments and fabrics for outdoor applications was generally hampered by the polyethylene's degradation under sunlight exposure and high temperature. But recently, mostly as a result of Reeves Bros. research, a new ultraviolet stabilized polyethylene filament (basically, a high-density type) called Reevon was put into production in a wide range of colors, including the brighter ones.

Polyethylene fiber-producing capacity is now estimated at 5 million lbs./year.

**Carbon Wool:** The atomics industry, too, has given a new starter to the fibers race. Called Carbon Wool, this fiber is made from carbon by Atomic Laboratories, Inc. (Berkeley, Calif.). Research in solid-state physics is responsible for this product, a fibrous carbon of high intrinsic density.

Carbon fibers aren't new. Earlier ones, however, were too weak mechanically to be used commercially. Black Carbon Wool, on the other hand, composed of very hard, nondusting carbon, has a high tensile strength. It can be woven into cloth, made into blankets, rope or protective clothing. Fiber diameters range from 5 to 50 microns. The carbon fiber can be activated without appreciable loss in physical properties.

Many industrial applications of Carbon Wool are in the offing. It could be used for thermal insulation, in filtration, as a catalyst surface where the fiber must act as a carrier. Because the fiber can be produced with a wide variety of electrical resistances, it should find use in electronics applications.

Other possible uses are myriad: in smog filters, cigarette filters, sugar and food manufacture, and for high-temperature insulation (up to 3000 C). Carbon Wool sells for $5/cu. ft. in 1,000-cu. ft. lots.

**Protein Fibers:** Regenerated protein fibers have never been great commercial successes. A casein fiber made in Germany 50 years ago was short-lived.

An improved casein fiber, Merinova, is still being manufactured in limited quantities in Italy and other countries. Aralac, the U.S. casein fiber (made by National Dairy), was withdrawn from the market shortly after World War II.

Another protein fiber, Vicara, made by Virginia-Carolina Chemical Corp. was produced from corn protein. Virginia-Carolina is reported to have discontinued Vicara production. Many factors, including short supply of raw materials, contributed to the fiber's troubles.

Production of Imperial Chemical

Industries' Ardil, a peanut fiber, was discontinued last year.

Except for the few that are still being turned out (in limited quantities) abroad, protein fibers have never quite been able to make the grade. Markets for this type of fiber could be captured, perhaps, if they could be marketed at about half the price of wool.

## GLASS FIBERS TOP A MARK

**Last year, for the first time,** glass-fiber production topped the 100-million-lbs./year mark, by 9.6 million lbs. That's a 655% production increase in just 12 years. There's plenty more room for growth. By '75, glass fibers should be well up in the 600-million-lbs./year bracket.

While glass fibers are not being marketed for apparel purposes, they have shown a consistent rise in household applications, especially for curtains and draperies. Improved methods of coloring and finishing are mainly responsible for these gains.

The great potential market for glass fibers is in industrial applications, especially in combination with plastics. Boats, sports car bodies, swimming pools, TV cabinets, walls, missile parts, tanks and pipes are just a few outlets.

According to a recent report of the reinforced-plastics division of the Society of the Plastics Industry, the biggest single existing use for glass fiber-reinforced plastics is in flat and corrugated paneling. Some 50 million sq. ft. of such paneling was produced in '57. Total tonnage sales of glass fiber-reinforced plastics are estimated at 168 million lbs./year for '57.

An estimated 45,000 glass fiber-reinforced plastic boats (nine times the number produced in '50) were made last year. These boats range in size from tiny dinghies to 41-ft. yawls.

A promising application of glass fibers is in insect screening. Vinyl finishes are being used to impart the necessary stiffness.

## PLACE FOR CERAMICS

**In '55, The Carborundum Co.** (Niagara Falls, N.Y.) began marketing Fiberfrax, an aluminum silicate fiber. It withstands temperatures above 2000 F and is sold as roving, yarn, cord, rope, tape and fabric, among other forms. Yarns consist of a blend of 15% carrier fiber and 85% Fiberfrax.

Because of its low thermal conductivity, fabrics made of Fiberfrax display unusually good insulating properties. High bulk, resilience and minute fiber size (about 4 microns, average) are other distinguishing features.

As high-temperature technology evolves (spurred by rapid developments in atomics, rocketry and missiles), fibers such as Fiberfrax, Carbon Wool and Teflon will be more and more in demand by industrial users. While the output tonnages of these fibers will always remain small, compared with over-all man-made fiber tonnages, their impact will nevertheless be felt by chemicals suppliers who depend on growth of the man-made fibers industry for their continuing prosperity.

## FASTER OVERSEAS ACTIVITY

**So far, this report has dealt** with man-made fiber developments, mostly in the U.S. But synthetic fiber developments here are closely keyed in with fiber activities abroad.

As far as trade is concerned, the U.S. in '56 showed an import balance of trade of 53.9 million lbs. of rayon and acetate fibers, and an export balance of 20.7 million lbs. of synthetic fibers and 139.5 million lbs. of other man-made fibers (mostly glass).

Many of the new fiber developments overseas are especially significant.

- In Sweden, an interesting modification of the spinning process—spinning from solvent into a hydrocarbon on the counterflow principle—produces an acrylic fiber with a porous surface. Fiber name: Tacryl.
- Two important fiber developments have come from Japan. One, a fiber based on polyvinyl alcohol, is in commercial production. Estimated output: 30 million lbs. in '57. The fiber's top feature is its water resistance, but it isn't hydrophobic—it picks up 30% of its own weight in water. No serious dyeing problems have been encountered.

Fabrics made with the fiber have a pleasing feel, high strength, good dye affinity and favorable "textile" properties. Many of the properties, including strength, can be modified to suit end-use applications.

Some snags (low softening point and lack of resiliency mainly) must still be overcome, but otherwise the Japanese PVA contender has an excellent chance of becoming a big-volume seller. In fact, it may have the best chance of all the new fibers developed in the U.S. or abroad. Reasons: PVA is a low-cost raw material that is water soluble; the fiber can be wet-spun into a salt-coagulating bath and made insoluble by treating with formaldehyde.

But the Japanese may face a tough fight: a pilot plant to produce a PVA fiber in the U.S. will be built in '59.

The other Japanese fiber development involves a condensation product of nonamethylene diamine and urea. Called Urylon by its manufacturer (Toyo Koatsu Industries), the produced fiber is generically categorized as a polyurea. The 9-carbon diamine is made from azelaic acid.

Toyo claims the following properties for Urylon: dry and wet strength—5- to 5.5-grams/denier; low density—1.07, lighter than nylon or Dacron; Young's modulus double that of nylon and Dacron; melting point—240 C to 250 C, higher than nylon's; 15-20% elongation, equal to Dacron, lower than nylon.

A Urylon plant will start up soon with an initial output of 1 ton/day. Output will be slowly increased to 15 to 20 tons/day.

- A new French polyamide fiber, Rilsan nylon-11, is just beginning to stir up activity in the U.S. Widely used in Italy and France, Rilsan is now being imported here for mill testing purposes. A U.S. firm is reportedly interested in obtaining licenses for the process. The new nylon is made from a polymer of 11-amino undecanoic acid, derived from castor oil. Soc. Organico (France) originally developed the product, but Snia Viscosa (Italy) perfected it. Rilsan has the lowest specific weight of any polyamide fiber (1.04 for Rilsan vs. 1.14 for nylon). Its melting point, too, is lower than that of nylon-66 or -6.
- In Russia, nylon-7 fiber, based on oenoanthic or heptoic acid, reportedly is stronger and more flexible than nylon-6. Activity on pelargonic acid, a 9-carbon chain, to produce nylon-9 is also going on in Russia.
- New developments in stereospecific catalysis in Italy are bound to influence U.S. fiber production here.

Isotactic propylene looks quite promising. Montecatini is in pilot-plant production with Moplen (mentioned earlier in this report).

Because the fiber's polypropylene raw material is low in cost, Moplen should have a price advantage if it meets application expectations. However, because Moplen must be melt-spun, the cost advantage may be somewhat offset.

At least six U.S. chemical producers are eyeing with interest this polypropylene development, some of them for its use in fibers as well as plastics.

More and more interplay of licensing arrangements continues between U.S. and foreign fiber manufacturers.

Du Pont has licensed numerous foreign concerns to manufacture nylon-66, is said to be negotiating with four Japanese companies that would produce Orlon acrylic fiber.

Toyo Rayon Co. (Japan), a company that now makes nylon-66 as a Du Pont licensee and Terylene as an ICI licensee, plans to have a 10-tons/-day Orlon plant onstream by '60.

Chemstrand has successfully concluded an agreement with Societa Edison (Italy) to build a new acrylic fiber plant. Chemstrand has also announced a licensing arrangement with Mitsubishi Rayon Co. (Japan). Construction of an Acrilan acrylic fiber plant at Coleraine, in northern Ireland for Chemstrand Ltd. continues on schedule.

Considerable research activity both here and abroad involves the synthesis of polypeptides, the chemical link between polymers and proteins. Courtaulds Ltd. (England) is carrying out fundamental studies at its Maidenhead laboratory to perfect a fiber closely resembling silk. Still a long way from commercial production, a fiber has nevertheless been produced. It's another major advance in synthetic fiber technology, this time in protein fiber development.

### PERSPECTIVE

**For making man-made fibers,** producers first used nature's high polymer—cellulose to make cellulosic fibers. Count Chardonnet's "artificial silk," cellulose nitrate, gave way to viscose, a xanthate-regenerated cellulose. Cuprammonium rayons, cellulose acetate fibers, di- and then tri-acetate followed closely behind. Now, synthetic polymer advances have contributed synthetic fibers.

Just as the "rayons" had taken a steadily increasing share of total fiber demand at the expense of natural fibers, so the synthetics are building their future at the expense of the cellulosics.

Du Pont closed down its viscose staple plant at Buffalo a number of years ago. The firm is now studying the feasibility of replacing the Old Hickory, Tenn., viscose plant with a $20-million Dacron installation.

American Viscose shut its doors at its Marcus Hook viscose plant and entered the synthetic fibers field with a 50-50 interest in Chemstrand. Tennessee Eastman discontinued acetate staple production last year and broached acrylic and polyester fiber production instead.

Other man-made fiber producers have begun strengthening their position in synthetics by turning out small tonnages of the products or undertaking synthetic fiber development projects.

Synthetic fiber production may have its temporary ups and downs, but the trend is clearly toward still more impressive synthetic fiber outputs. Cellulosics will grow in volume, too, but not as spectacularly.

## Meet the Author

**Eugene Schwarz** (Ph.D., '23; University of Erlangen, Germany) is president of Skeist & Schwarz Laboratories (Newark, N.J.)—consulting firm specializing in synthetic polymers, especially man-made fibers, dyes and plastics. Schwarz has 35 years of fibers, textile and dyestuff experience. In Germany, he was associated with the Textile Research Institute (M. Gladbach) and with Badische Aniline.

Here, he has held textile research posts with General Dyestuff Corp. and Sears, Roebuck. His work gives him entree to many of the big fiber producing and finishing firms both in the U.S. and abroad. Schwarz edited the first "Rayon Handbook," was president and editor of *Melliand*, the technical textile journal that later became *Rayon Textile Monthly*. He co-edited "Textile Auxiliaries," published last year.

This CW Report grew out of his recent paper on man-made fibers given before the Assn. of Consulting Chemists and Chemical Engineers (New York). He is a director of the latter group.

# Who's Who in the U.S. Man-Made Fibers Industry

**A listing of 35 key producers of man-made fibers in this country, their trademarks, plant locations and what they produce.**

| Producer | Plant locations | Tradenames | Remarks |
|---|---|---|---|
| **Viscose, Acetate and Cuprammonium Fibers** | | | |
| American Enka Corp. | Enka, N.C.<br>Lowland, Tenn. | Briglo, Perlglo, Viscose, Tempra, Englo, Jetspun, Suprenka, Super Suprenka, Skyloft | High-tenacity viscose filament; regular filament and staple; spun-dyed filament; bulked filaments |
| American Viscose Corp. | Lewistown, Pa.<br>Meadville, Pa.<br>Front Royal, Va.<br>Roanoke, Va.<br>Nitro, W. Va.<br>Parkersburg, W. Va. | Avisco, Rayflex, Super Rayflex, Minifil, Super L, Avicron, Colorspun | High-tenacity viscose filament; acetate filament; high-tenacity and regular staple; regular filament and staple; spun-dyed viscose filament and staple; spun-dyed acetate filament; capacity: 490 million lbs./year |
| American Bemberg Division, Beaunit Mills Inc. | Elizabethton, Tenn. | Bemberg, Matesa, Cupioni, Strata, Cupracolor, Cupracolor-Sunspun | Cuprammonium filament; spun-dyed cuprammonium filament |
| Coosa Pines Division, Beaunit Mills Inc. | Childersburg, Ala. | Super-high Tenacity | High-tenacity viscose filament |
| North American Rayon Corp. Division, Beaunit Mills Inc. | Elizabethton, Tenn. | Super-Narco, High Narco | High-tenacity and regular viscose filament |
| Skenandoa Rayon Corp. Division, Beaunit Mills Inc. | Utica, N.Y. | Veri-Dul, Skendo | Regular viscose |
| Celanese Corp. of America | Cumberland, Md.<br>Narrows, Va.<br>Rockhill, S.C.<br>Rome, Ga. | Celanese, Fortisan Rayon, F-Fortisan 36, Celaperm, Arnel (triacetate), Celacloud, Celafil, Celair, Quilticel | Acetate filament and staple; solution-dyed acetate; viscose filament and staple; Arnel triacetate filament and staple |
| Courtaulds (Alabama) Inc. | LeMoyne, Ala. | Coloray, Fibro | White and spun-dyed viscose staple; capacity: 150 million lbs./year |
| E.I. duPont de Nemours & Co., Inc. | Old Hickory, Tenn.<br>Richmond, Va.<br>Waynesboro, Va. | Cordura, Super Cordura, Color Sealed | High-tenacity and regular viscose filament; spun-dyed acetate |

| Producer | Plant locations | Tradenames | Remarks |
|---|---|---|---|
| Fair Haven Mills Inc. | Fair Haven, Vt. | | Filament |
| Hartford Rayon Co. Division, Bigelow Sanford Carpet Co. | Rocky Hill, Conn. | Hartford, Viscalon, Colorborn | Monofilament; staple; spun-dyed carpet staple |
| Industrial Rayon Corp. | Cleveland, O. Painesville, O. Covington, Va. | Covinair, Covingtone, Dul-Tone, Eiderlon, Lectrostat, Nupron, Premier, Spun Black, Spun Lo, Suede-Skin, Superwind, Tyron | High-tenacity and regular viscose filament |
| Mohasco Industries Inc., New Bedford Rayon Division | New Bedford, Mass. | | Regular filament |
| Tennessee Eastman Co., division of Eastman Kodak Co. | Kingsport, Tenn. | Estron, Chromspun | Filament and lofted yarns |
| **Acrylic Fibers** | | | |
| American Cyanamid Co. | Stamford, Conn. Pensacola, Fla. | Creslan | Pilot plant at Stamford; Pensacola staple and tow plant due onstream early '59, capacity: 27 million lbs./year |
| The Chemstrand Corp. | Decatur, Ala. | Acrilan | Staple and tow; capacity: 30 million lbs./year plus additional 15 million lbs./year in '58 |
| E.I. duPont de Nemours & Co., Inc. | Camden, S.C. Waynesboro, Va. | Orlon | Staple and tow; Waynesboro facility due onstream mid '58; capacity at Camden: 80 million lbs./year; capacity at Waynesboro: 40 million lbs./year |
| Tennessee Eastman Co. | Kingsport, Tenn. | Verel | Staple |
| Dow Chemical Co. | Pittsburg, Calif. Lee Hall, Va. | Zefran | Pittsburg pilot plant now supplying staple until Lee Hall plant comes onstream in mid '58; reported capacity: 12-15 million lbs./year |
| Union Carbide Chemicals Co. | South Charleston, W. Va. | Dynel | Staple and tow; capacity: 6-8 million lbs./year |

| Producer | Plant locations | Tradenames | Remarks |
|---|---|---|---|
| **Polyamide Fibers** | | | |
| Allied Chemical & Dye Corp., National Aniline Division | Chesterfield, Va.<br>Hopewell, Va. | Caprolan | Nylon-6 yarns, staple and tow are produced at Chesterfield; Hopewell produces caprolactam monomer; caprolactam capacity will be doubled to 60 million lbs./year by early '59 |
| American Enka Corp. | Enka, N.C. | Enka Nylon | Nylon-6 filament yarns and staple; $5-million expansion announced to increase capacity 75%, due onstream late '58 |
| The Chemstrand Corp. | Pensacola, Fla. | Chemstrand | Nylon-66 textile and tire yarn; nylon capacity boosted to 114 million lbs./year from 50 million lbs. in '53 |
| Dawbarn Brothers Inc. | Waynesboro, Va. | Dawbarn | Nylon-6 and nylon-66 monofilaments; Dawbarn Co. in Rio Tiedras, Puerto Rico also produces nylon fibers |
| E. I. duPont de Nemours & Co., Inc. | Seaford, Del.<br>Chattanooga, Tenn.<br>Martinsville, Va.<br>Richmond, Va. | Du Pont | Nylon-66 textile and tire yarns, staple and tow; Richmond site capacity: 40 million lbs./year, came onstream Jan. '58 |
| Firestone Plastics Co., division of Firestone Rubber Co. | Pottstown, Pa. | Firestone | Nylon-6 and nylon-66 monofilaments |
| Industrial Rayon Corp. | Covington, Va. | IRC | Nylon-6 yarn, staple and tow |
| The National Plastics Products Co. | Odenton, Md. | National | Nylon-6 and nylon-66 monofilaments |
| North American Rayon Corp. | Elizabethton, Tenn. | | Nylon-6 pilot plant |
| Poliafil, Inc. | Scranton, Pa. | Poliafil | Nylon-6 and nylon-66 monofilaments for hosiery |
| Polymers, Inc. | Middlebury, Vt. | Polymers | Nylon-6 monofilaments |

| Producer | Plant locations | Tradenames | Remarks |
|---|---|---|---|
| **Polyester Fibers** | | | |
| E. I. duPont de Nemours & Co., Inc. | Kinston, N.C. | Dacron | Estimated capacity: 50 million lbs./year; yarn, staple and tow; feasibility studies continue on a $20-million Dacron plant at Old Hickory, Tenn. |
| Tennessee Eastman Co. | Kingsport, Tenn. | T-900 (Code name) | Pilot plant |
| **Polyethylene Fibers** | | | |
| Bolta Products Division, General Tire & Rubber Co. | Lawrence, Mass. | Poly-Bolta | Monofilaments |
| Dawbarn Brothers Inc. | Waynesboro, Va. | Dawbarn, DLP | Monofilaments |
| Firestone Plastics Co. | Pottstown, Pa. | Firestone, Velon LP | Monofilaments |
| The National Plastics Products Co. | Odenton, Md. | Wynene | Monofilaments |
| Reeves Brothers Inc. | Spartanburg, S.C. | Reevon | Monofilaments |
| **Polystyrene Fibers** | | | |
| Dawbarn Brothers Inc. | Waynesboro, Va. | Dawbarn, Acrylast | Monofilaments |
| Polymers, Inc. | Middlebury, Vt. | Shalon | Monofilaments |
| **Polyvinylidene Chloride Fibers** | | | |
| Bolta Products | Lawrence, Mass. | Boltaflex | Monofilaments |
| Dawbarn Brothers Inc. | Waynesboro, Va. | Dawbarn | Yarn and monofilaments |
| Firestone Plastics Co. | Pottstown, Va. | Velon | Yarn, monofilaments, staple and tow |
| The National Plastics Products Co. | Odenton, Md. | National | Monofilaments |
| Oriented Plastics, Inc. | Pembroke, N.H. | Oriented | Monofilaments |
| The Saran Yarns Co. | Odenton, Md. | Saran | Yarn, monofilaments, staple and tow |
| Southern Lus-trus Corp. | Jacksonville, Fla. | Lus-trus | Monofilaments |
| **Tetrafluoroethylene Fiber** | | | |
| E.I. duPont de Nemours & Co., Inc. | Richmond, Va. | Teflon | Industrial yarn and staple |

| Producer | Plant locations | Tradenames | Remarks |
|---|---|---|---|
| **Dinitrile Fiber** | | | |
| B. F. Goodrich Chemical Co. | Avon Lake, O. | Darvan (Darlan) | Pilot plant produces staple; process is based on vinylidene cyanide |
| **Acrylonitrile-Styrene Fiber** | | | |
| Polymers, Inc. | Middlebury, Vt. | Algil | Monofilaments |
| **Plasticized Polyvinyl Chloride Fiber** | | | |
| Polymers, Inc. | Middlebury, Vt. | "45" | Monofilaments |
| **Vinyl Chloride Acetate Fibers** | | | |
| Polymers, Inc. | Middlebury, Vt. | Bristrand | Monofilaments |
| American Viscose Corp. | Meadville, Pa. | Vinyon | Staple. Capacity: 3 million lbs./year |
| **Vegetable Protein Fibers** | | | |
| Virginia-Carolina Chemical Corp. | Taftville, Conn. | Vicara, Zycon | Staple and tow; process based on zein, a corn protein |
| **Carbon Fiber** | | | |
| Atomic Laboratories Inc. | Berkeley, Calif. | Carbon Wool | Staple |
| **Inorganic Fibers** | | | |
| The Carborundum Co. | Niagara Falls, N.Y. | Fiberfrax | Staple; aluminum silicate |
| Ferro Corp., Fiber Glass Division | Huntington Beach, Calif.<br>Nashville, Tenn. | Unifab, Uniformat, Unirove | Glass-fiber yarn and staple |
| L. O. F. Glass Fibers Co. | Parkersburg, W. Va.<br>Defiance, O.<br>Waterville, O.<br>Burbank, Calif. | Garan, Vitron | Glass-fiber yarn and staple |
| Owens-Corning Fiberglas Corp., Textile Division | Ashton, R.I.<br>Anderson, S.C.<br>Huntingdon, Pa. | Fiberglas | Glass-fiber yarn and staple |
| Pittsburgh Plate Glass Co., Fiber Glass Division | Shelbyville, Ind. | Pittsburgh PPG | Glass-fiber yarn and staple |
| Modiglass Fibers Inc. | Bremen, O. | Modiglass | Glass-fiber yarn and staple |

# Who's Who in Foreign Man-Made Fibers Industries

**A checklist of 385 foreign trademarks, the fiber types they represent and producers in 22 countries, including five Iron Curtain nations.**

| Country | Fiber Tradename | Type | Producer |
|---|---|---|---|
| Argentina | Ducilo | Polyamide | Ducilo S.A. |
| | Ducilon | Acrylic | Ducilo S.A. |
| Belgium | Acrybel | Acrylic | Fabelta |
| | Alastra | Viscose | Fabelta |
| | Belimat | Viscose | Fabelta |
| | Cargan | Protein | Le Lanital Belge |
| | Daryl | Acrylic | Fabelta |
| | Fabelmat | Viscose | Fabelta |
| | Fibramine | Viscose | Fabelta |
| | Fibrelta | Viscose | Fabelta |
| | High 10 | Viscose | Fabelta |
| | Lanital | Protein | Le Lanital Belge |
| | Sava | Viscose | Fabelta |
| | Scaldyna | High-tenacity viscose | Fabelta |
| | Setilmat | Acetate | Fabelta-Tubize |
| | Setilose | Acetate | Fabelta-Tubize |
| | Setina | Acetate | Fabelta-Tubize |
| | Silionne | Glass | Soc. Isoverbel |
| | Suprasta | Viscose | Fabelta |
| | Tubasta | Viscose | Fabelta |
| | Tubize | Viscose | Fabelta-Tubize |
| | Verranne | Glass | Soc. Isoverbel |
| Brazil | Foicco | Viscose | Fiacao Brasiliera |
| | Novatex | Viscose | Fiacao Brasiliera |
| | Perlon | Polyamide | Industrias Reunidas Matarazzo |
| | Rhodianil | Polyamide | CIA Brasiliera Rhodiaceta |
| | Rilsan | Polyamide | Rilsan Brasiliera, S.A. |
| | Trital | Viscose | Fiacao Brasiliera |
| Canada | Celechrome | Acetate | Canadian Celanese Ltd. |
| | CIL Nylon | Polyamide | Canadian Industries Ltd. |
| | Du Pont Nylon | Polyamide | Du Pont of Canada Ltd. |
| | Fiberglass | Glass | Fiberglass Canada Ltd. |
| | Orlon | Acrylic | Du Pont of Canada Ltd. |
| | Richmond | Polyvinylidene chloride | Richmonds Plastics Ltd. |
| | Terylene | Polyester | Canadian Industries Ltd. |
| | Trilan | Acetate | Canadian Celanese Ltd. |
| | Velon | Polyvinylidene chloride | Firestone Tire & Rubber Co. of Canada Ltd. |
| Czechoslovakia | Nordur | Polyamide | |
| Egypt | Misr. Nylon | Polyamide | Societe Misr. pour Rayonne S.A.E. |

| Country | Fiber Tradename | Type | Producer |
| --- | --- | --- | --- |
| **England** | Acetat Ips. | Acetate | Courtaulds Ltd. |
| | Acrilan | Acrylic | Chemstrand Ltd. |
| | Alginate | Alginate | Courtaulds Ltd. |
| | Ardil* | Protein | Imperial Chemical Industries |
| | Bexan | Polyvinyl chloride | B.X. Plastics Ltd. |
| | B.X. | Polyvinylidene chloride | B.X. Plastics Ltd. |
| | Celafibre | Acetate | British-Celanese-Courtaulds |
| | Celafil | Acetate | British-Celanese-Courtaulds |
| | Celon | Polyamide | British-Celanese-Courtaulds |
| | Cheviot | Viscose | North British Rayon Ltd. |
| | Coloray | Viscose | Courtaulds Ltd. |
| | Cordulla | Viscose | Courtaulds Ltd. |
| | Courlene | Polyethylene | Courtaulds Ltd. |
| | Courpleta | Acetate | Courtaulds Ltd. |
| | Courtelle | Acrylic | Courtaulds Ltd. |
| | Delustra | Viscose | Courtaulds Ltd. |
| | Fiberglass | Glass | Fiberglass Ltd. |
| | Fibro | Viscose | Courtaulds Ltd. |
| | Fibroceta | Acetate | Courtaulds Ltd. |
| | Fibrolane | Viscose-protein | Courtaulds Ltd. |
| | Jedmat | Viscose | North British Rayon Ltd. |
| | Jedpak | Viscose | North British Rayon Ltd. |
| | Marlspun | Acetate | Courtaulds Ltd. |
| | Mattesco | Viscose | Courtaulds Ltd. |
| | Neochrome | Viscose | Harbens Ltd. |
| | Neoplex | Viscose | Harbens Ltd. |
| | Nylon BNS | Polyamide | British Nylon Spinners |
| | Opaceta | Acetate | Courtaulds Ltd. |
| | Paramount | Viscose | North British Rayon Ltd. |
| | Rayolanda | Viscose | Courtaulds Ltd. |
| | Seraceta | Acetate | Courtaulds Ltd. |
| | Tenasco | High-tenacity viscose | Courtaulds Ltd. |
| | Terylene | Polyester | Imperial Chemical Industries |
| | Tricel | Acetate | Courtaulds Ltd. |
| | Tudenza | Viscose | Courtaulds Ltd. |
| | Typel | Acetate | Courtaulds Ltd. |
| France | Albene | Acetate | Societe Rhodiaceta |
| | Clorene | Polyvinylidene chloride | Soc. Rhovyl S.A. |
| | Crylor | Polyamide | Societe Rhodiaceta |
| | Fibrovyl | Polyvinyl chloride | Soc. Rhovyl S.A. |
| | Isovyl | Polyvinyl chloride | Soc. Rhovyl S.A. |
| | Lamita | Viscose | Soc. de la Viscose |
| | Lamo | Viscose | Soc. de la Viscose |
| | Meryl | Viscose | Comptoir des Textiles Artificiels |
| | Nerane | Acetate (black) | Societe Rhodiaceta |
| | Oceane | Acetate (black) | Societe Rhodiaceta |
| | Rhodia | Acetate | Societe Rhodiaceta |
| | Rhodia Nylon | Polyamide | Societe Rhodiaceta |
| | Rhofil | Polyvinyl chloride | Societe Rhodiaceta |
| | Rhovyl | Polyvinyl chloride | Soc. Rhovyl S.A. |
| | Rilsan | Polyamide | Soc. Organico |

*Production discontinued.

| Country | Fiber Tradename | Type | Producer |
|---|---|---|---|
| France (*Cont.*) | Stratimat | Glass | Soc. du Veurre Textile |
| | Tergal | Polyester | Societe Rhodiaceta |
| | Thermovyl | Polyvinyl chloride | Soc. Rhovyl S.A. |
| | Trialbene | Acetate | Societe Rhodiaceta |
| West Germany | Aceta | Acetate | Bayer |
| | Bemberg | Cuprammonium | I. P. Bemberg |
| | Rayon Hoechst | Viscose | Bobingen-Hoechst |
| | Colcesa | Viscose | Glanzstoff-Courtaulds |
| | Colcord | Viscose | Glanzstoff-Courtaulds |
| | Colnova | Viscose | Glanzstoff-Courtaulds |
| | Colomal | Viscose | Glanzstoff-Courtaulds |
| | Colva | Viscose | Glanzstoff-Courtaulds |
| | Colvadur | Viscose | Glanzstoff-Courtaulds |
| | Cuprador | Cuprammonium plus Dralon | Bayer |
| | Cupralon | Cuprammonium plus Perlon | Bayer |
| | Cuprama | Cuprammonium staple | Bayer |
| | Cupresa | Cuprammmonium filament | Bayer |
| | Danufil | Viscose | Sueddeutsche Zellwolle |
| | Diolen | Polyester | Vereinigte Glanzstoff Fabr. |
| | Dolan | Acrylic | Sueddeutsche Zellwolle |
| | Dralon | Acrylic | Bayer |
| | Drawinella | Acetate | Wacker-Chemie |
| | Flox | Viscose | Spinnfaser A.G. |
| | Furon | Polyamide | Phrix Werke |
| | Gecesa | Viscose | Glanzstoff-Courtaulds |
| | Glanzstoff | Viscose | Vereinigte Glanzstoff Fabr. |
| | Harlon | Copolymer | International Galalith Ges. |
| | IGG Saran | Polyvinylidene chloride | International Galalith Ges. |
| | Lanusa | Viscose | Badische Aniline |
| | Lonzona | Acetate | Lonzona-Saeckingen |
| | Nefa | Polyamide | Vereinigte Glanzstoff Fabr. |
| | Nefalon | Polyamide | Vereinigte Glanzstoff Fabr. |
| | Northylen | Polyethylene | Norddeutsche Seekabel Werke |
| | Novamat | Viscose | Glanzstoff-Courtaulds |
| | PAN | Acrylic | Bayer |
| | Pe Ce | Polyvinyl chloride | Agfa and Badische Aniline |
| | Pe Ce N | Polyvinyl chloride | Agfa and Badische Aniline |
| | Pe Ce 120 | Polyvinyl chloride | Casella |
| | Perlon | Polyamide | Hoechst |
| | Perlon | Polyamide | Bayer |
| | Perlon U | Polyurethane | Bayer |
| | Phrilon | Polyamide | Phrix Werke |
| | Phrix | Viscose | Phrix Werke |
| | Redon | Acrylic | Phrix Werke |
| | Rhodia | Acetate | Deutsche Rhodiaceta A.G. |
| | Rhodia Nylon | Polyamide | Deutsche Rhodiaceta A.G. |
| | Rhodiafil | Acetate | Deutsche Rhodiaceta A.G. |
| | Rhodialin | Acetate | Deutsche Rhodiaceta A.G. |
| | Rhovyl | Polyvinyl chloride | Deutsche Rhodiaceta A.G. |
| | Rotwyla | Viscose | Rottweiler Kunstseidenfabrik |
| | Saran | Polyvinylidene chloride/vinyl chloride | Bolta Werke |
| | Sirius | Viscose | Vereinigte Glanzstoff Fabr. |

| Country | Fiber Tradename | Type | Producer |
|---|---|---|---|
| West Germany (*Cont.*) | Styroflex | Polystyrene | Norddeutsche Seekabel Werke |
| | Suleine | Viscose | Phrix Werke |
| | Supramid | Polyamide | Badische Aniline |
| | Supron | Polyamide | Kalle |
| | Synthofil | Polyvinyl alcohol | Wacker-Chemie |
| | Thermovyl | Polyvinyl chloride | Deutsche Rhodiaceta A.G. |
| | Trevira | Polyester | Hoechst |
| | Vestan | Polyvinyl chloride | Chemische Werke Huels |
| | Zehla | Viscose | Spinnstoff Fabrik Zehlendorf |
| East Germany | Eftrelon | Copolymer | Thueringische Kunstfaser Fabrik, Schwarza |
| | Kufasa | Cuprammonium | Kuettner, Pirna |
| | Kuseta | Cuprammonium | Kuettner, Pirna |
| | Kuseta-Tussahfil | Cuprammonium | Kuettner, Pirna |
| | Lanon | Polyester | Thueringische Kunstfaser Fabrik, Schwarza |
| | Pe Ce | Polyvinyl chloride | Agfa-Wolfen |
| | Prelana | Acrylic | Kunstseidewerk Premnitz |
| | Prezenta | Viscose | Kunstseidewerk Premnitz |
| | Schwarza | Viscose | Thueringische Kunstfaser Fabrik, Schwarza |
| | Suprema | Viscose | Kunstseidewerk Premnitz |
| | Textra | Viscose | Chemiefaser Fabrik Sydowsaue |
| | Thiolan | Protein | Thueringische Kunstfaser Fabrik, Schwarza |
| | Thiozell | Protein | Thueringische Kunstfaser Fabrik, Schwarza |
| | Travis | Viscose | Kunstseidewerk Premnitz |
| | Trelon | Polyamide | Thueringische Kunstfaser Fabrik, Schwarza |
| | Vistra | Viscose | Kunstseidewerk Premnitz |
| | Wolacryl | Acrylic | Agfa-Wolfen |
| | Wolcrylon | Acrylic | Agfa-Wolfen |
| Holland | Amplum | Viscose | Algemene Kunstzijhde Unie |
| | Akulon | Polyamide | Algemene Kunstzijhde Unie |
| | Bredanese | Viscose | N.V. Hollandsche Kunstzijhde Industrie, Breda |
| | Cantona | Viscose | Algemene Kunstzijhde Unie |
| | Casenka | Protein | Algemene Kunstzijhde Unie |
| | Casolana | Protein | Vereenigung Melkwollfabrik |
| | Conyma | Viscose | Nyma Rayon Works, Nijmwegen |
| | Conymex | Viscose | Nyma Rayon Works, Nijmwegen |
| | Crispella | Viscose | N.V. Hollandsche Kunstzijhde Industrie, Breda |
| | Cronenka | Viscose | Algemene Kunstzijhde Unie |
| | Dien | Polyamide | N.V. de Bataafsche Petroleum Mj. |
| | Draka-Saran | Copolymer | N.V. Holl. Draad en Kabelfabriek |
| | Emera | Viscose | N.V. Hollandsche Kunstzijhde Industrie, Breda |
| | Enkalon | Polyamide | Algemene Kunstzijhde Unie |
| | Enkalene | Polyester | Algemene Kunstzijhde Unie |
| | Extrema | Viscose | N.V. Hollandsche Kunstzijhde Industrie, Breda |
| | Flatessa | Viscose | N.V. Hollandsche Kunstzijhde Industrie, Breda |

| Country | Fiber Tradename | Type | Producer |
|---|---|---|---|
| Holland (*Cont.*) | Lactofil | Protein | Algemene Kunstzijhde Unie |
| | Matenka | Viscose | Algemene Kunstzijhde Unie |
| | Matenkanese | Viscose | Algemene Kunstzijhde Unie |
| | Matenkona | Viscose | Algemene Kunstzijhde Unie |
| | Nobricella | Viscose | N.V. Hollandsche Kunstzijhde Industrie, Breda |
| | Nyma | Viscose | Nyma Rayon Works, Nijmwegen |
| | Nymata | Viscose | Nyma Rayon Works, Nijmwegen |
| | Nymatco | Viscose | Nyma Rayon Works, Nijmwegen |
| | Nymella | Viscose | Nyma Rayon Works, Nijmwegen |
| | Nymellamat | Viscose | Nyma Rayon Works, Nijmwegen |
| | Nymex | Viscose | Nyma Rayon Works, Nijmwegen |
| | Nymcord | Viscose | Nyma Rayon Works, Nijmwegen |
| | Nymcrylon | Polyamide | Nyma Rayon Works, Nijmwegen |
| | Superarnum | Viscose | Algemene Kunstzijhde Unie |
| | Super Breda | Viscose | N.V. Hollandsche Kunstzijhde Industrie, Breda |
| | Tenax | High-tenacity viscose | Algemene Kunstzijhde Unie |
| | Terlenka | Polyester | Algemene Kunstzijhde Unie |
| | Ultrenka | Viscose | Algemene Kunstzijhde Unie |
| Hungary | Efylon | Polyamide | |
| Israel | Polymer R | Polyamide | Rehovot Research Labs. |
| | Rehovot | Copolymer | The United Saran Plastics Co. |
| | United | Polyvinylidene chloride | The United Saran Plastics Co. |
| Italy | Albula | Viscose | Snia Viscosa |
| | Argentea | Viscose | Snia Viscosa |
| | Bobol | Viscose | Snia Viscosa |
| | Cisalfa | Viscose plus protein | Snia Viscosa |
| | Crinol | Viscose | Snia Viscosa |
| | Delfion | Polyamide | Bombini Parodi-Delfino |
| | Fiocco | Viscose | Snia Viscosa |
| | Forlion | Acrylic | S.A. Orsi e Mangelli, Forli |
| | Helion | Polyamide | Chatillon, S.A. |
| | Ivorea | Viscose | Snia Viscosa |
| | Lilion | Polyamide | Snia Viscosa |
| | Lucisa | Viscose | Snia Viscosa |
| | Merinova | Protein | Snia Viscosa |
| | Moplen | Polypropylene | Montecatini |
| | Movyl | Polyvinyl chloride | Polymer Ind. Chimice, Terni |
| | Nailon | Polyamide | S.A. Rhodiatoce |
| | Novaceta | Acetate | S.A. Novaceta |
| | Ortalion | Polyamide | S.A. Bemberg |
| | Rilsan | Polyamide | Snia Viscosa |
| | Silene | Acetate | S.A. Novaceta |
| | Sniol | Polyvinyl chloride | Snia Viscosa |
| | Terital | Polyethylene | S.A. Rhodiatoce |
| | Vetrotessile | Glass | Modigliani, S.P.A. |
| | Virion | Viscose | Snia Viscosa |
| Japan | Amilan | Polyamide | Toyo Rayon Co. |
| | Chiba-Ken | Glass | Asahi-Glass Fiber Co. |
| | Cremona | Polyvinyl acetate | Kurashiki Rayon Co. |
| | Envilon | Polyvinyl chloride | Toyo Chemical Co. |
| | Exlan | Acrylic | Nippon Exlan Kogyo K.K. |

| Country | Fiber Tradename | Type |
|---|---|---|
| Japan (*Cont.*) | Grilon | Polyamide |
| | Ice-Berg | Glass |
| | Iwakuni | Polyvinyl acetate |
| | Kanebian | Polyvinyl acetate |
| | Kanekalon | Acrylic |
| | Kuralon | Polyvinyl acetate |
| | Kuravilon | Polyvinyl acetate |
| | Kurehalon | Copolymer |
| | Kuremona | Polyvinyl acetate |
| | Mewlon | Polyvinyl acetate |
| | Newlon | Polyvinyl acetate |
| | Niplon | Polyamide |
| | Saran | Polyvinylidene chloride |
| | Silcool | Protein |
| | Suda | Viscose |
| | Tevilon | Polyvinyl chloride |
| | Toramomen | Viscose |
| | Vinylan | Polyvinyl acetate |
| | Vinylon | Polyvinyl acetate |
| | Woolon | Copolymer |
| Mexico | Celanese | Polyamide |
| Norway | Kasilga | Viscose |
| | Supral | Viscose |
| Poland | Furon | Polyamide |
| | Plavia | Viscose |
| | Polan | Polyamide |
| | Steelon | Polyamide |
| | Stylon | Polyamide |
| Spain | Dayan | Polyamide |
| | Frilon | Polyamide |
| | Perlofil | Polyamide |
| | Perlon | Polyamide |
| | Safa Nylon | Polyamide |
| Sweden | Tacryl | Acrylic |
| Switzerland | Armon | Viscose |
| | Bodanyl | Polyamide |
| | Celta | Viscose |
| | Flimba | High-tenacity viscose |
| | Flisca | Viscose |
| | Grilon | Polyamide |
| | Mirlon | Polyamide |
| | Nylswuisse | Polyamide |
| | Roylon | Polyamide |
| | Vetrofles | Glass |
| | Vetrotex | Glass |
| U.S.S.R. | Kapron | Polyamide |
| | Nitrilon | Acrylic |
| Venezuela | Perlon | Polyamide |

# CW Report

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Shinko Rayon Co.
Kurashiki Rayon Co.
Mitsubishi Rayon Co.
Japanese Synthetic Fiber Co.

Celanese Mexicana S.A.

Kunstsilkefabrikken, Notodden
Atkieselskapet, Borregaard

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Plabag A.G., Romanshorn
Soc. Suisse de la Viscose
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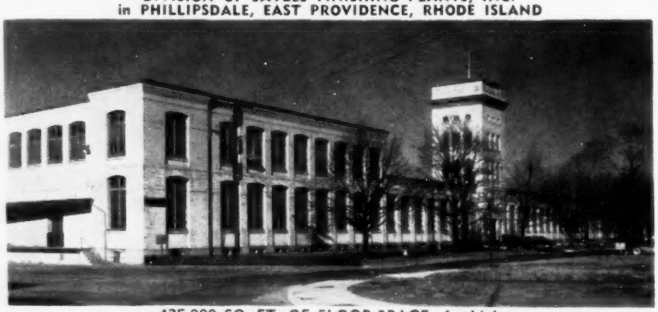

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***Bird 32″ x 50″ Solid Bowl Centrifugal. Steel*** contact parts. Late model. Perry Equipment Corp., 1415 N. 6th St., Phila. 22, Pa.

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**Detroit 26** .... 856 Penobscot Bldg., H. J. Sweger, Jr., WOodward 2-1793

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**Los Angeles 17** .... John B. Uphoff, 1125 West Sixth St., MAdison 6-9351

**New York 36** .... Knox Armstrong, B. A. Johnson, P. F. McPherson, Charles F. Onasch, L. Charles Todaro, 500 5th Ave., OXford 5-5959

**Philadelphia 3** .... William B. Hannum, Jr., Architects Bldg., 17th & Sansom Sts., RIttenhouse 6-0670

**Pittsburgh 22** .... V. K. Dissette, Room 1111 Henry W. Oliver Bldg., ATlantic 1-4707

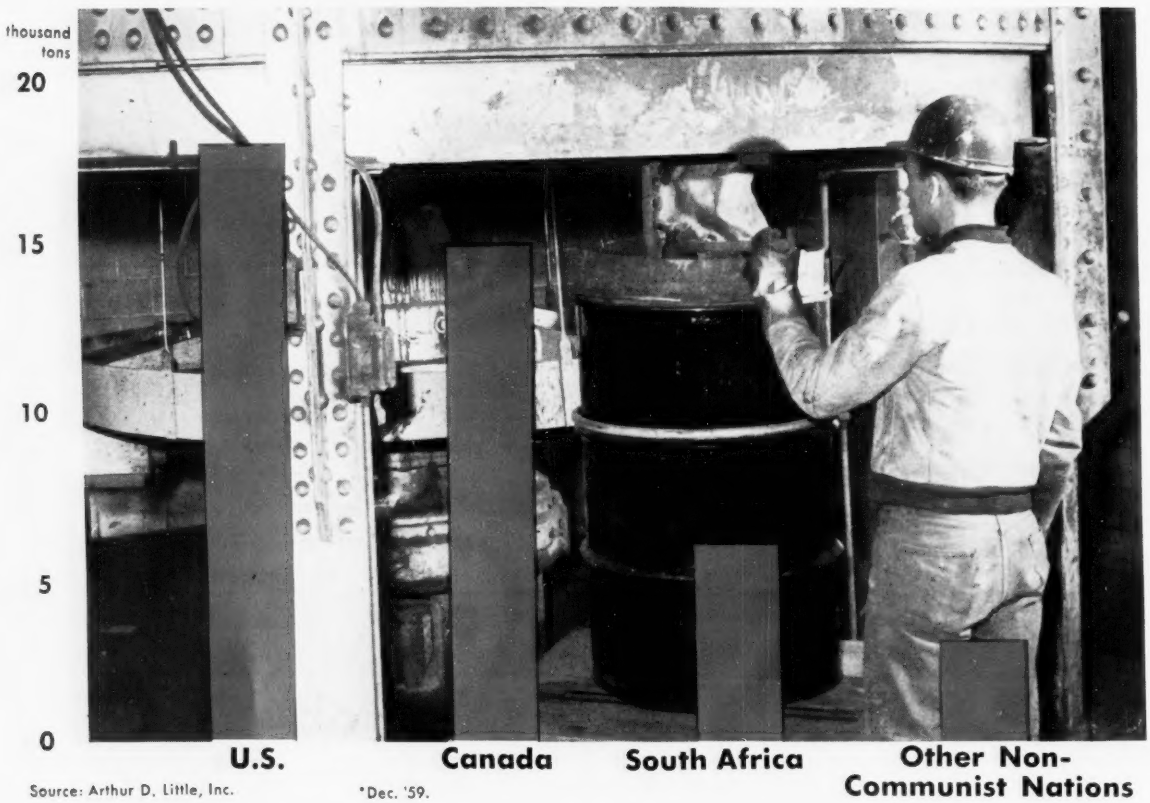
**San Francisco 4** .... William C. Woolston, 68 Post St., DOuglas 2-4600

**St. Louis 8** .... 3615 Olive St., Continental Bldg., R. J. Claussen, JEfferson 5-4867

# CHARTING BUSINESS

March 8, 1958

## Uranium Oxide Capacity*




Source: Arthur D. Little, Inc. *Dec. '59.

# U. S. Builds Uranium Milling Capacity

**By the end of '59,** the U.S. will have nearly half of the total of non-Soviet nations' capacity for milling uranium oxide concentrate, with an 18,000-tons/year potential output. Canadian capacity is 15,000 tons/-year, South Africa, 6,000 tons/year; the Congo, France, Australia and Portugal have an aggregate of some 3,000-tons capacity. Thus, by the end of the decade, total milling capacity in non-Communist nations will be 42,000 tons/year.

The reserves of uranium from which production can be obtained at costs now regarded as economical are estimated at some 1 million tons for the non-Communist countries. About 75% of these reserves are found in the U.S., Canada and South Africa. Prospects are favorable for development of an additional 1-million-tons reserve in these countries and in the Congo, France, Australia and Portugal.

Big surprise in the reserve picture has been the dark-horse performance of the U.S. mining industry. Back in '54, U.S. uranium reserves were estimated at some 20,000 tons. As a result of discoveries at Ambrosia Lake, near Grants, N.M., however, and new productive areas in Wyoming, latest estimates peg U.S. uranium reserves at some 250,000 tons.